United States
Environmental Protection
Agency

Office of Pollution
Prevention and Toxics
(7408)

EPA-745-R-99-004
March 1999

EPA

33/50 Program
The Final Record

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33/50 Program: The Final Record

The 33/50 Program targeted 17 priority chemicals (Box 1) and set as its goal a 33% reduction in releases and transfers of these chemicals by 1992 and a 50% reduction by 1995, measured against a 1988 baseline. The first of EPA's growing series of voluntary programs, its primary purpose was to demonstrate whether voluntary partnerships could augment the Agency's traditional command-and-control approach by bringing about targeted reductions more quickly than would regulations alone.

The program also sought to foster a pollution prevention ethic, encouraging companies to consider and apply pollution prevention approaches to reducing their environmental releases rather than traditional end-of-the-pipe methods for treating and disposing of chemicals in waste.

Key Findings

- The 33/50 Program achieved its goal in 1994, one year ahead of schedule, primarily through program participants' efforts.
- Although the largest reductions in 33/50 Program chemicals reflected U.S. action to phase out ozone-depleting chemicals under the Montreal Protocol, facilities also reduced releases and transfers of the other 33/50 chemicals by 50% from 1988 to 1995.
- Facilities reported more source reduction activity (pollution prevention) for 33/50 chemicals than for other TRI chemicals and this activity covered a greater percentage of production-related waste for 33/50 chemicals than for other TRI chemicals.
- Reductions continued at a higher rate for 33/50 chemicals than for other TRI chemicals in the year after the 33/50 Program ended.

Box 1. 17 Targeted Chemicals

Benzene	Tetrachloroethylene	Cadmium and cadmium compounds
Carbon tetrachloride	Toluene	Chromium and chromium compounds
Chloroform	1,1,1-Trichloroethane	Cyanide compounds
Dichloromethane	Trichloroethylene	Lead and lead compounds
Methyl ethyl ketone	Xylenes	Mercury and mercury compounds
Methyl isobutyl ketone		Nickel and nickel compounds

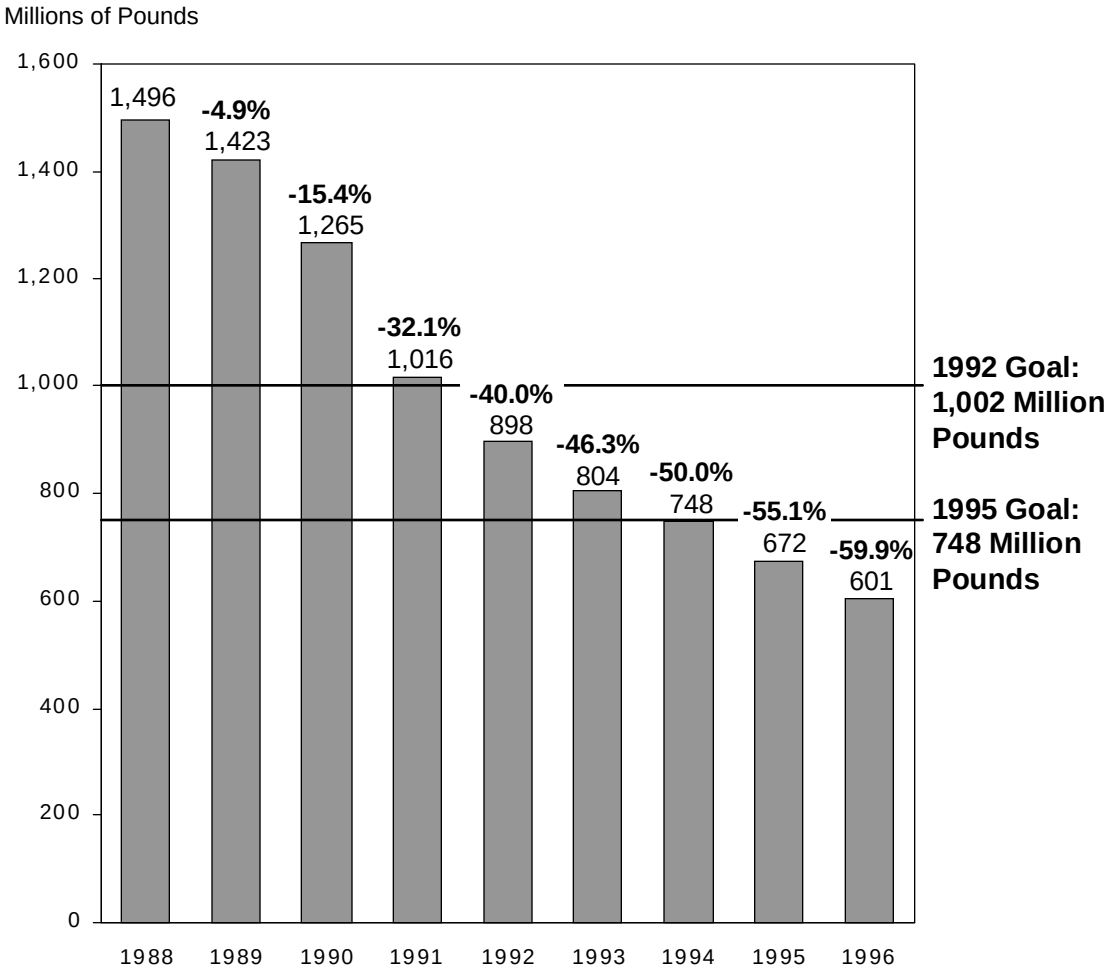
Program Goals Met and Exceeded

The 33/50 Program met its ultimate goal—a 50% reduction in releases and transfers of the 17 targeted chemicals—in 1994, one year early (see Figure 1). The most recent data show a 1988 baseline total for the 17 chemicals of 1.496 billion pounds of on-site releases and transfers off-site to treatment and disposal—and a 1994 total of 748 million pounds. In 1995, releases and transfers of the 33/50 chemicals totaled 672 million pounds, and by 1996, releases and transfers had dropped nearly 60% from the 1988 baseline, to 601 million pounds. (Box 2 explains the data presented in this report.)

33/50 Program Releases and Transfers: Overview

For the 17 targeted chemicals, on-site releases and transfers off-site to treatment and disposal decreased from 1.496 billion pounds in 1988 to 672 million pounds in 1995 and further to 601 million pounds in 1996, as shown in Table 1. Over the five years that the 33/50 Program operated, releases and transfers of the 17 targeted chemicals reported to TRI decreased 47%. This is an average percent decrease per year of more than 9% for 1990-1995, compared to less than 8% per year for the two previous years (1988-1990) and nearly 11% for the year after (1995-1996).

Figure 1. Releases and Transfers of 33/50 Program Chemicals, 1988-1996



Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Table 1. Releases and Transfers of 33/50 Program Chemicals vs. Other TRI Chemicals, 1988-1996

Year	All TRI Chemicals (Excluding Additions/ Deletions) Pounds	TRI Chemicals Less 33/50 Chemicals Pounds	33/50 Chemicals Only Pounds
1988	4,020,250,532	2,524,122,352	1,496,128,180
1990	3,428,644,482	2,163,382,571	1,265,261,911
1995	2,289,147,796	1,616,832,014	672,315,782
1996	2,216,858,876	1,616,250,453	600,608,423
	Percent Change	**Percent Change**	**Percent Change**
1988-1990	-14.7	-14.3	-15.4
1990-1995	-33.2	-25.3	-46.9
1995-1996	-3.2	-0.04	-10.7

Note: Does not include delisted chemicals, chemicals added in 1990, 1991, 1994 and 1995, ammonia, aluminum oxide, hydrochloric acid, and sulfuric acid. Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

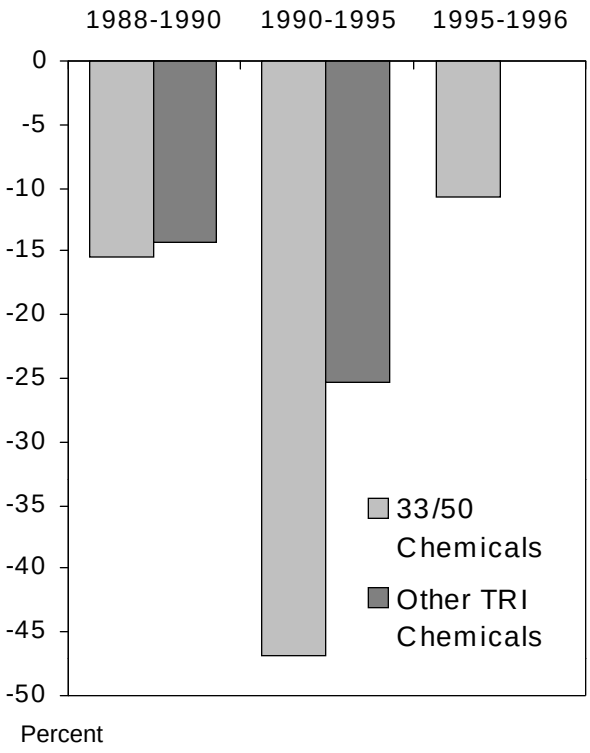
Box 2. Measure of Progress: Releases and Transfers

The types of on-site environmental releases reported to TRI have not changed from the first reporting year—air emissions, surface water discharges, underground injection, and on-site releases to land. The types of off-site transfers that must be reported, however, have expanded. In the early years of TRI, facilities reported off-site transfers to treatment (by private facilities or by publicly owned treatment works, POTWs) and to disposal. Although TRI later began collecting data on transfers off-site to recycling and to energy recovery, these were not covered by the 33/50 Program. The 33/50 Program therefore measured its progress in reducing all release types plus transfers to treatment, POTWs, and disposal, based on the original TRI reporting categories.

With publication of the 1996 TRI data, EPA revised its summary presentations to reflect more closely the character of certain off-site transfer types, specifically transfers to disposal. Because off-site disposal also results in environmental release of the chemical, EPA began categorizing these transfers as an off-site release. Data tables in this report adhere to this scheme, presenting total on- and off-site releases (including transfers to disposal as off-site releases) plus off-site transfers to treatment (including POTWs). "Releases and transfers" in this report refers to these specific release and transfer categories.

Tables and figures in this report emphasize three time periods in the 33/50 Program's history: 1988-1990 captures information before the program began, 1990-1995 measures progress during the program's tenure, 1995-1996 tracks developments in the first year after the program ended. Some tables and figures compare amounts reported for 33/50 chemicals to reporting for all other TRI chemicals. To control for changes in the TRI chemical list over time, year-to-year comparisons of this type are based on a consistent list of chemicals reported in all years 1988 to 1996. Because TRI facilities can correct or revise their reports at any time for any year, summary data measuring the achievements of the 33/50 Program change somewhat from year to year. Data in this report are from the 1996 TRI database, as summarized in *1996 Toxics Release Inventory: Public Data Release*, EPA 745-R-98-005, May 1998.

Figure 2. Percent Reductions in Releases and Transfers of 33/50 Program Chemicals vs. Other TRI Chemicals, 1988-1996



Note: Does not include delisted chemicals, chemicals added in 1990, 1991, 1994 and 1995, ammonia, aluminum oxide, hydrochloric acid, and sulfuric acid. Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

33/50 Program chemicals outpaced all other TRI chemicals for reductions in releases and transfers in all three time periods shown in Table 1 and Figure 2. Before the program began, the percentage reduction in 33/50 chemicals (15%) was already somewhat greater than the reduction in other TRI chemicals (14%). During the years the program operated, however, facilities reported much greater percentage reductions in the targeted chemicals (47%) than for the others (25%). An even greater difference in percentage reductions appeared in the year since the program's close, as 33/50 chemicals dropped nearly 11% compared to almost no decrease in other TRI chemicals (a 0.04% reduction).

Company Participation

EPA devoted considerable outreach effort for the 33/50 Program, focused on facilities reporting to TRI on any of the targeted chemicals from 1988 to 1994—more than 20,000 facilities in all. Initial communications were directed to the chief executive officers of parent companies of these facilities. In the spring and summer of 1991, invitations to participate in the program went to a total of 5,000 companies. Another 2,500 more were invited to participate over the next three years. (See Table 2.)

Nearly 1,300 companies (13% of all eligible companies) responded with commitments to the 33/50 Program, and their facilities reported more than 60% of the 1988 releases and transfers of the 33/50 chemicals.

EPA concentrated much of its outreach on the "top 600" companies—those with the greatest amounts of releases and transfers. (As mailing lists improved and companies merged, the number of actual companies contacted was closer to 500 than 600, but the name for this group remained "Top 600.") These companies received the first invitations to participate and were the focus of greater follow-up from 33/50 Program headquarters and region staff. This concentration on larger companies proved effective: 64% of these companies participated in the Program, compared to less than 14% of the smaller companies.

Reductions Pledged

EPA encouraged participants to set their own reduction goals, oriented to their own time frames, and most did so. Of the 1,294 companies participating, 1,066 set measurable goals for reducing their releases and transfers of the 17 targeted chemicals against the 1988 baseline. These pledges totaled 370 million pounds,

Table 2. 33/50 Program Overview

	Parent Companies /Date Contacted						
	Top 600 March 1991	5,400 Companies July 1991	New in RY 1989 July 1992	New in RY 1990 January 1993	New in RY 1991 January 1994	New since RY 1992 Not Contacted	Total from All Companies
	Number of Companies						
Companies with 33/50 Facilities	509	4,534	940	818	754	2,612	10,167
Responses with Commitments to 33/50 Program	328	819	60	40	40	7	1,294
Responses with Numerical Goals Not Quantifiable to the 1988 Baseline	26	136	37	15	13	1	228
Responses with Use Reduction Goals Only	13	65	8	3	0	1	90
	Quantities of the 17 Targeted Chemicals Covered by the 33/50 Program Millions of Pounds, 1988						
Total Releases and Transfers Reported to TRI in 1988	993	367	6	13	26	89	1,496
Total from the Companies Making Commitments	809	110	2	5	7	1	935
Total from the Companies with Quantifiable Commitments	697	69	1	5	6	0	778
Pledged Reductions from the Companies with Quantifiable Commitments	327	37	1	2	3	0	370

RY = reporting year
Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

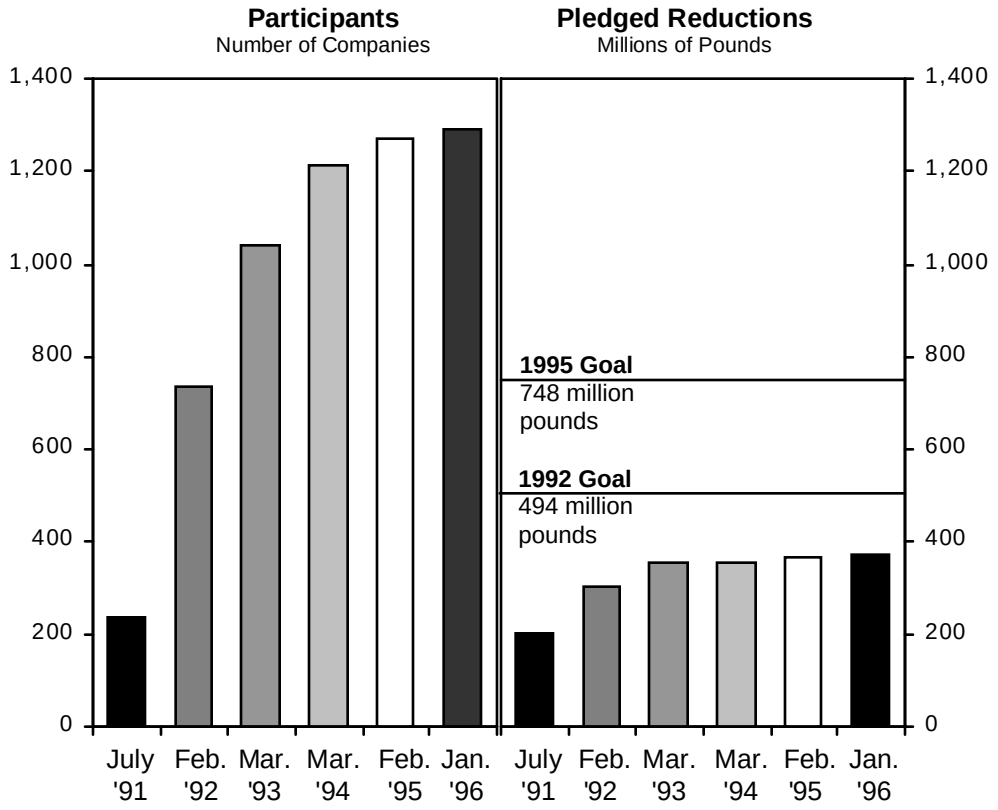
representing a little less than half of their total 1988 releases and transfers of 778 million pounds. (See Table 2 and Figure 3.)

Other participant companies developed goals tied to changes in their production levels, chose alternative baseline years, or set a reduction target for all their TRI reporting without specifying goals for the 33/50 chemicals. Some made general commitments, without numerical goals. Some companies took a pollution prevention approach, pledging to reduce their use of the targeted chemicals. These pledges did not always specify targeted goals for reducing releases and transfers. As a result, the 370 million pounds of pledged reductions in releases and transfers represented a lower bound on the reductions that companies attempted under the 33/50 Program.

Participant Goals Met and Exceeded

Participants whose commitments could be calculated against the 1988 baseline achieved 507 million pounds of reductions from 1988 to 1995.

Figure 3. 33/50 Program Participant Status, January 1996



This greatly exceeded the group's total pledges (370 million pounds) and amounted to 65% of the group's 1988 baseline amount (778 million pounds)—well beyond the 50% national target. (See Table 3 and Figure 4.)

Companies for whom commitments could not be calculated against a 1988 baseline achieved another 90 million pounds of reductions, out of 156 million pounds reported for 1988. This group achieved a 58% reduction from 1988 to 1995. Altogether, program participants in the program accomplished a 64% reduction from 1988 to 1995.

Facilities belonging to companies that did not participate in the program also achieved reductions, totaling 227 million pounds from 1988 to 1995 or 40%.

Releases and Transfers by Chemical

On-site releases and transfers off-site to treatment and disposal that facilities reported to TRI for the 17 targeted chemicals for 1988, 1990, 1995, and 1996 appear in Table 4. For 1988 to 1995, the largest percentage reduction—88%—was reported for 1,1,1-trichloroethane, an ozone-depleting chemical discussed in more detail below. The largest absolute reduction—199 million pounds—was reported for toluene. Toluene, the chemical with the largest releases and transfers in 1988 (367 million pounds), remained the top 33/50 chemical in 1995 (169 million pounds) and 1996 (150 million pounds).

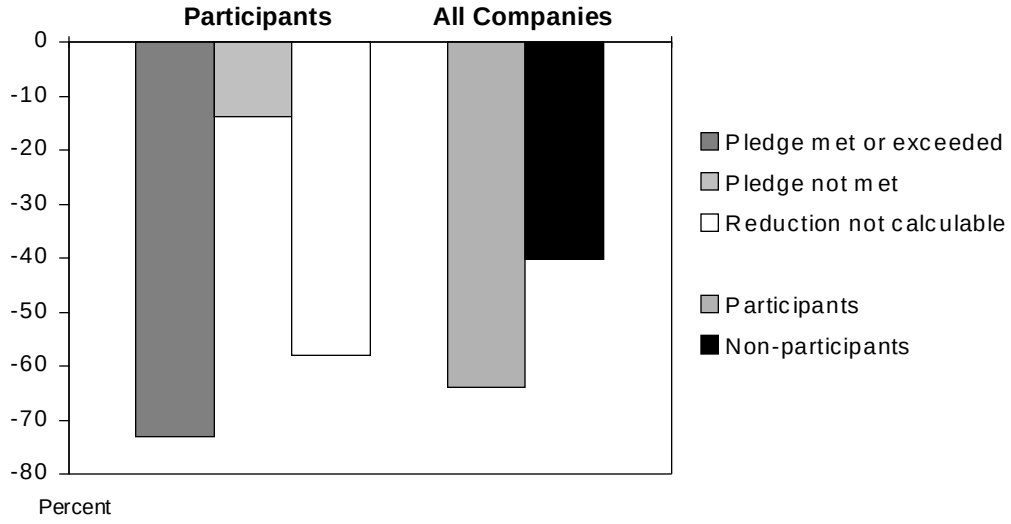
Table 3. 33/50 Program Achievements by Participant Status

Type of Commitment	Companies Number	Facilities Number	Total Releases and Transfers 1988 Pounds	1990 Pounds	1995 Pounds	1996 Pounds
Pledge met or exceeded	593	4,280	674,578,344	525,903,816	182,386,324	163,733,891
Pledge not met	186	794	103,809,831	88,485,666	89,481,192	85,468,331
Subtotal for companies with quantifiable commitments	779	5,074	778,388,175	614,389,482	271,867,516	249,202,222
Reduction not calculable	515	1,756	156,152,275	129,016,102	65,661,861	53,376,905
Subtotal for participants	1,294	6,830	934,540,450	743,405,584	337,529,377	302,579,127
Non-participants	8,873	14,615	561,587,730	521,856,327	334,786,405	298,029,296
Total	10,167	21,445	1,496,128,180	1,265,261,911	672,315,782	600,608,423

Type of Commitment	1988-1995 Reduction Achieved Pounds	Pledged Reduction Pounds	Percent Change 1988-1990 Percent	1990-1995 Percent	1988-1995 Percent
Pledge met or exceeded	492,192,020	315,603,486	-22.0	-65.3	-73.0
Pledge not met	14,328,639	54,234,768	-14.8	1.1	-13.8
Subtotal for companies with quantifiable commitments	506,520,659	369,838,254	-21.1	-55.7	-65.1
Reduction not calculable	90,490,414	0	-17.4	-49.1	-58.0
Subtotal for participants	597,011,073	369,838,254	-20.5	-54.6	-63.9
Non-participants	226,801,325	0	-7.1	-35.8	-40.4
Total	895,519,757	369,838,254	-15.4	-46.9	-55.1

Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Figure 4. Percent Change in Releases and Transfers of 33/50 Program Chemicals: Participants vs. Non-participants, 1988-1996



Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Table 4. Releases and Transfers of 33/50 Program Chemicals, 1988, 1990, 1995, 1996

CAS Number	Chemical	Year	Forms Number	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Under-ground Injection Pounds
71-43-2	Benzene	96	472	3,365,712	4,753,759	27,376	312,766
		95	468	4,020,284	5,259,238	21,301	282,642
		90	504	14,917,148	10,926,395	25,303	689,066
		88	483	20,664,086	11,677,898	46,732	825,035
56-23-5	Carbon tetrachloride	96	64	140,533	210,317	215	44,515
		95	69	140,135	254,041	717	53,966
		90	100	432,955	1,320,385	4,718	31,557
		88	95	1,101,201	2,694,047	15,627	98,050
67-66-3	Chloroform	96	156	3,086,308	6,235,110	340,396	45,387
		95	160	3,333,191	6,942,723	330,352	33,276
		90	192	8,594,655	14,527,935	997,560	89,560
		88	169	7,790,990	18,197,619	1,114,965	36,000
75-09-2	Dichloromethane	96	909	21,519,922	31,900,543	10,060	749,507
		95	998	23,064,126	34,905,022	28,620	1,140,335
		90	1,455	38,239,458	62,761,354	194,764	850,018
		88	1,676	49,679,087	79,480,442	349,960	1,478,833
78-93-3	Methyl ethyl ketone	96	2,100	20,641,669	38,426,835	74,989	432,772
		95	2,286	25,026,991	44,718,128	65,520	556,607
		90	2,728	45,853,410	88,809,753	95,083	146,209
		88	2,531	41,981,304	99,116,021	92,076	255,955
108-10-1	Methyl isobutyl ketone	96	911	4,570,658	14,312,039	22,569	162,000
		95	1,011	5,632,099	16,147,952	51,292	158,600
		90	1,126	9,879,327	18,570,578	55,593	52,226
		88	1,011	13,049,874	18,985,959	762,108	116,650
127-18-4	Tetrachloro-ethylene	96	394	3,095,666	4,765,504	1,311	13,436
		95	434	4,588,748	4,950,002	2,407	20,481
		90	666	9,342,044	13,597,047	21,510	11,012
		88	746	16,335,782	19,786,515	33,314	72,250
108-88-3	Toluene	96	3,200	41,711,487	83,670,741	68,697	329,275
		95	3,420	52,433,574	93,577,558	53,291	310,691
		90	4,297	88,134,301	161,950,285	201,580	1,432,923
		88	4,003	106,246,178	193,156,221	196,957	1,473,666
71-55-6	1,1,1-Trichloro-ethane	96	390	4,339,326	4,428,210	844	1,354
		95	795	11,002,844	12,088,982	1,118	126
		90	4,219	85,805,762	83,172,300	16,984	1,586
		88	3,921	93,139,461	87,702,388	95,624	1,000
79-01-6	Trichloro-ethylene	96	663	10,665,331	10,606,835	541	1,291
		95	733	12,375,423	13,667,466	1,477	550
		90	810	19,051,257	20,948,735	14,285	805
		88	953	26,168,376	29,775,360	13,801	390
—	Xylenes	96	3,229	22,267,595	65,461,914	43,517	183,980
		95	3,436	25,319,157	76,654,035	36,098	95,103
		90	3,994	37,616,000	111,960,295	49,549	105,399
		88	3,649	39,922,654	129,751,037	213,032	144,978

Table 4.

On-site Releases to Land Pounds	Off-site Releases (Transfers to Disposal) Pounds	Total On- and Off-site Releases Pounds	Transfers to Treatment Pounds	Transfers to to POTWs Pounds	Other Off-site Transfers* Pounds	Total Transfers Pounds	Total Releases and Transfers Pounds
76,157	65,750	8,601,520	1,491,143	214,698	6	1,705,847	10,307,367
18,582	71,391	9,673,438	1,780,401	218,505	0	1,998,906	11,672,344
717,008	264,685	27,539,605	1,918,780	635,478	38,048	2,592,306	30,131,911
125,228	396,880	33,735,859	1,892,869	1,165,252	7,430	3,065,551	36,801,410
0	9,245	404,825	1,600,815	480	0	1,601,295	2,006,120
0	7,735	456,594	738,973	473	0	739,446	1,196,040
1,005	10,163	1,800,783	1,072,020	42,050	5	1,114,075	2,914,858
14,759	49,703	3,973,387	1,300,058	5,014	250	1,305,322	5,278,709
32,709	38,868	9,778,778	1,860,389	329,533	0	2,189,922	11,968,700
4,297	6,636	10,650,475	1,644,237	418,401	0	2,062,638	12,713,113
57,992	82,714	24,350,416	1,237,677	802,260	1,260	2,041,197	26,391,613
68,647	143,124	27,351,345	1,204,786	1,226,573	20,365	2,451,724	29,803,069
4,957	116,409	54,301,398	11,903,667	640,294	1,815,884	14,359,845	68,661,243
2,064	176,467	59,316,634	10,893,108	799,579	2,140	11,694,827	71,011,461
21,024	1,001,707	103,068,325	7,852,367	1,293,254	651,644	9,797,265	112,865,590
157,156	10,154,983	141,300,461	11,198,082	1,831,154	1,089,604	14,118,840	155,419,301
139,598	247,023	59,962,886	4,887,309	598,327	70,490	5,556,126	65,519,012
87,856	217,811	70,672,913	5,883,761	502,492	5,830	6,392,083	77,064,996
50,591	3,035,746	137,990,792	17,255,862	891,841	752,896	18,900,599	156,891,391
166,597	5,014,725	146,626,678	22,189,902	964,168	2,063,186	25,217,256	171,843,934
4,858	35,672	19,107,796	1,233,056	299,154	2,013	1,534,223	20,642,019
7,041	86,316	22,083,300	1,503,755	398,672	3,866	1,906,293	23,989,593
24,738	732,806	29,315,268	3,816,880	1,259,294	50,273	5,126,447	34,441,715
31,770	1,966,238	34,912,599	6,075,272	1,509,030	2,467,760	10,052,062	44,964,661
30,442	22,071	7,928,430	1,440,050	1,847	0	1,441,897	9,370,327
6	72,961	9,634,605	2,192,750	14,997	75,924	2,283,671	11,918,276
1,260	796,846	23,769,719	3,676,603	450,922	75,032	4,202,557	27,972,276
82,144	1,385,378	37,695,383	4,059,045	558,691	138,270	4,756,006	42,451,389
557,160	1,022,535	127,359,895	22,051,736	599,828	60,979	22,712,543	150,072,438
85,798	881,153	147,342,065	20,733,577	850,357	5,168	21,589,102	168,931,167
370,832	4,980,475	257,070,396	34,698,580	1,769,464	953,045	37,421,089	294,491,485
643,668	9,615,791	311,332,481	47,861,093	3,593,521	4,662,390	56,117,004	367,449,485
26,303	34,031	8,830,068	1,023,362	10,318	0	1,033,680	9,863,748
38,470	124,363	23,255,903	1,270,732	3,922	0	1,274,654	24,530,557
62,446	3,865,652	172,924,730	8,676,227	173,194	583,606	9,433,027	182,357,757
204,923	5,947,875	187,091,271	12,158,277	305,358	1,310,826	13,774,461	200,865,732
23,140	76,327	21,373,465	1,606,178	86,392	0	1,692,570	23,066,035
3,577	57,670	26,106,163	1,042,803	15,073	0	1,057,876	27,164,039
12,554	753,864	40,781,500	3,063,098	11,949	156,119	3,231,166	44,012,666
21,186	1,466,469	57,445,582	4,693,074	85,652	360,514	5,139,240	62,584,822
330,008	508,478	88,795,492	8,712,588	921,968	16,690	9,651,246	98,446,738
144,661	584,692	102,833,746	15,605,052	932,012	7,055	16,544,119	119,377,865
423,453	4,574,162	154,728,858	20,179,239	1,957,018	663,625	22,799,882	177,528,740
647,989	6,646,896	177,326,586	27,449,055	4,225,457	3,865,706	35,540,218	212,866,804

Note: Does not include delisted chemicals, chemicals added in 1990, 1991, 1994 and 1995, ammonia, aluminum oxide, hydrochloric acid, and sulfuric acid. Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996. For 1995 and 1996, Other Off-site Transfers are transfers reported without a valid waste management code. For 1988 and 1990, Other Off-site Transfers are transfers reported without a valid waste management code or with codes not required to be reported in 1988 and 1990.

Table 4. Releases and Transfers of 33/50 Program Chemicals, 1988, 1990, 1995, 1996, Continued

CAS Number	Chemical	Year	Forms Number	Fugitive or Nonpoint Air Emissions Pounds	Stack or Point Air Emissions Pounds	Surface Water Discharges Pounds	Underground Injection Pounds
—	Cadmium and cadmium compounds	96	143	7,890	36,774	4,624	82
		95	157	9,657	34,151	1,103	109
		90	258	31,035	72,270	3,344	1,575
		88	205	32,399	90,293	4,147	2,409
—	Chromium and chromium compounds	96	3,169	522,191	372,505	711,411	37,431
		95	3,284	441,163	752,690	154,966	60,780
		90	3,121	575,193	577,482	451,176	83,242
		88	2,454	626,332	701,374	401,219	54,902
—	Cyanide compounds	96	272	200,729	3,035,142	107,159	4,005,897
		95	289	275,551	3,280,566	90,229	5,112,794
		90	370	240,948	1,721,580	129,669	4,981,412
		88	428	657,222	1,699,447	197,544	5,445,176
—	Lead and lead compounds	96	1,650	626,869	1,178,551	62,419	794
		95	1,670	727,657	1,299,403	63,051	912
		90	1,920	909,011	1,387,334	133,545	1,653
		88	1,598	839,523	1,822,375	242,159	2,760
—	Mercury and mercury compounds	96	34	12,155	4,942	541	9
		95	34	10,698	5,613	328	6
		90	63	14,793	8,756	809	21
		88	52	16,797	8,484	1,406	27
—	Nickel and nickel compounds	96	2,776	335,509	371,280	88,809	90,503
		95	2,728	250,988	337,470	77,971	114,256
		90	2,364	395,092	327,150	152,282	268,963
		88	1,747	425,992	299,282	222,619	239,263
	Total for 33/50 Chemicals	96	20,532	137,109,550	269,771,001	1,565,478	6,410,999
		95	21,972	168,652,286	314,875,040	979,841	7,941,234
		90	28,187	360,032,389	592,639,634	2,547,754	8,747,227
		88	25,721	418,677,258	694,944,762	4,003,290	10,247,344
	All Other TRI Chemicals	96	39,267	139,073,678	549,458,877	43,578,657	111,811,388
		95	39,913	136,086,168	571,646,796	34,939,024	131,967,260
		90	42,316	207,832,418	666,066,552	103,351,242	151,142,262
		88	36,990	262,251,735	804,988,566	160,548,096	151,721,788
	Total for All TRI Chemicals	96	59,799	276,183,228	819,229,878	45,144,135	118,222,387
		95	61,885	304,738,454	886,521,836	35,918,865	139,908,494
		90	70,503	567,864,807	1,258,706,186	105,898,996	159,889,489
		88	62,711	680,928,993	1,499,933,328	164,551,386	161,969,132

Table 4, Cont.

On-site Releases to Land Pounds	Off-site Releases (Transfers to Disposal) Pounds	Total On- and Off-site Releases Pounds	Transfers to Treatment Pounds	Transfers to to POTWs Pounds	Other Off-site Transfers* Pounds	Total Transfers Pounds	Total Releases and Transfers Pounds
553,447	938,552	1,541,369	227,611	3,147	1	230,759	1,772,128
378,711	1,710,293	2,134,024	193,287	4,200	46,535	244,022	2,378,046
397,773	1,170,634	1,676,631	149,534	13,762	230	163,526	1,840,157
389,479	1,114,047	1,632,774	169,830	21,613	2,941	194,384	1,827,158
26,900,022	16,744,943	45,288,503	3,971,183	297,040	5,441	4,273,664	49,562,167
22,559,978	21,613,907	45,583,484	5,512,127	359,242	32,955	5,904,324	51,487,808
25,983,804	22,591,037	50,261,934	4,223,860	1,144,767	7,609,067	12,977,694	63,239,628
40,215,263	21,982,102	63,981,192	3,879,311	2,093,099	1,231,272	7,203,682	71,184,874
76,104	96,345	7,521,376	408,257	237,514	0	645,771	8,167,147
18,583	149,764	8,927,487	481,566	240,829	500	722,895	9,650,382
19,720	382,575	7,475,904	919,363	141,644	1,880	1,062,887	8,538,791
108,969	582,431	8,690,789	1,985,587	1,162,724	151,159	3,299,470	11,990,259
14,979,456	23,220,634	40,068,723	14,078,006	47,511	728,614	14,854,131	54,922,854
14,684,821	19,095,190	35,871,034	7,491,293	58,363	1,258,520	8,808,176	44,679,210
18,986,126	49,189,908	70,607,577	4,714,364	192,997	3,069,720	7,977,081	78,584,658
26,684,305	24,982,994	54,574,116	5,156,979	213,675	934,592	6,305,246	60,879,362
537	25,884	44,068	14,441	15	0	14,456	58,524
1,016	208,075	225,736	16,739	24	871	17,634	243,370
4,199	154,209	182,787	58,835	311	261	59,407	242,194
13,279	235,963	275,956	38,804	1,892	0	40,696	316,652
3,959,588	8,238,804	13,084,493	2,924,939	180,123	12,301	3,117,363	16,201,856
2,734,229	8,593,604	12,108,518	2,015,593	182,133	1,271	2,198,997	14,307,515
5,094,399	8,492,583	14,730,469	4,024,282	318,122	3,743,608	8,086,012	22,816,481
3,609,583	10,335,657	15,132,396	3,065,730	905,143	497,290	4,468,163	19,600,559
47,694,486	51,441,571	513,993,085	79,434,730	4,468,189	2,712,419	86,615,338	600,608,423
40,769,690	53,658,028	586,876,119	78,999,754	4,999,274	1,440,635	85,439,663	672,315,782
52,228,924	102,079,766	1,118,275,694	117,537,571	11,098,327	18,350,319	146,986,217	1,265,261,911
73,184,945	102,021,256	1,303,078,855	154,377,754	19,868,016	18,803,555	193,049,325	1,496,128,180
252,285,064	213,564,295	1,309,771,959	168,585,298	137,526,856	366,340	306,478,494	1,616,250,453
231,654,898	202,119,907	1,308,414,053	157,497,112	150,174,598	746,251	308,417,961	1,616,832,014
343,336,714	275,777,574	1,747,506,762	170,522,567	223,284,027	22,069,215	415,875,809	2,163,382,571
385,929,166	284,440,328	2,049,879,679	214,826,737	234,940,404	24,475,532	474,242,673	2,524,122,352
299,979,550	265,005,866	1,823,765,044	248,020,028	141,995,045	3,078,759	393,093,832	2,216,858,876
272,424,588	255,777,935	1,895,290,172	236,496,866	155,173,872	2,186,886	393,857,624	2,289,147,796
395,565,638	377,857,340	2,865,782,456	288,060,138	234,382,354	40,419,534	562,862,026	3,428,644,482
459,114,111	386,461,584	3,352,958,534	369,204,491	254,808,420	43,279,087	667,291,998	4,020,250,532

Note: Does not include delisted chemicals, chemicals added in 1990, 1991, 1994 and 1995, ammonia, aluminum oxide, hydrochloric acid, and sulfuric acid. Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996. For 1995 and 1996, Other Off-site Transfers are transfers reported without a valid waste management code. For 1988 and 1990, Other Off-site Transfers are transfers reported without a valid waste management code or with codes not required to be reported in 1988 and 1990.

As illustrated in Figure 5, most of the chemicals showed consistent downward trends. However, reductions occurred at a different pace among the various chemicals. Figure 6 illustrates percentage changes for the 33/50 chemicals. Figure 6 also makes clear the more consistent reductions among organic chemicals on the 33/50 Program list, with the notable exception of carbon tetrachloride, and the more erratic results among inorganic substances on the list.

Organics versus Inorganics

Organic chemicals on the 33/50 Program's target list constituted the majority of the releases and transfers reported, as shown in Figure 7. Facilities also reported larger reductions by far for the organic chemicals than for inorganics, as shown in Figure 8. Releases and transfers of organic chemicals declined throughout 1988-1996, including a reduction of nearly 50% during 1990-1995. For the inorganic compounds, however, releases and transfers decreased 30% during 1990-1995 and increased before and after that time period. Because organic chemicals accounted for such a large proportion of the total reporting of 33/50 chemicals, their large percentage reductions determined the overall percentage reduction for the 33/50 chemicals.

Ozone Depleters

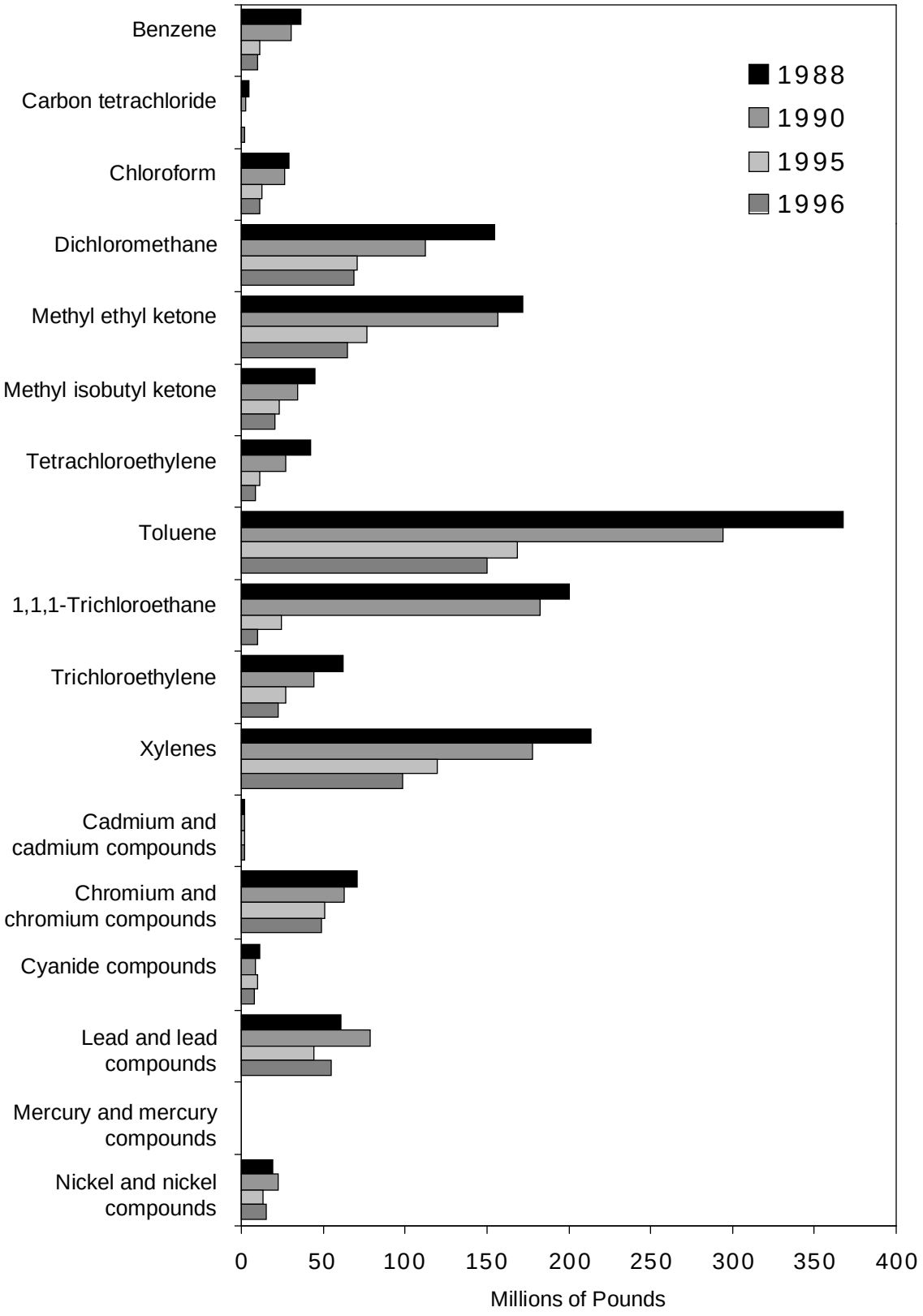
Among the organic substances targeted by the 33/50 Program were two ozone-depleting chemicals, carbon tetrachloride and 1,1,1-trichloroethane (TCA). The Montreal Protocol, opened for international signature in 1987 and amended in 1990 and 1992, called for phasing out the production and use of designated ozone-depleting chemicals by January 1, 1996. Implementing this agreement, the United States banned production of carbon tetrachloride and TCA by that deadline.

Carbon tetrachloride accounted for a relatively small portion of total releases and transfers of 33/50 chemicals, and its releases and transfers also declined substantially before the 33/50 Program began (from 5.3 million pounds in 1988 to 2.9 million pounds in 1990, a 49% decrease). With 201 million pounds of releases and transfers in 1988, however, the chemical 1,1,1-trichloroethane (TCA) constituted a much larger portion of the 33/50 Program's baseline. Further, releases and transfers of TCA) decreased only 9% from 1988 to 1990. (See Table 4 and Figure 6.)

From 201 million pounds in 1988, releases and transfers of TCA dropped to less than 25 million pounds in 1995 and under 10 million pounds in 1996. TCA accounted for one fifth of the overall reduction in 33/50 chemicals for 1988-1996. As noted, carbon tetrachloride was the one 33/50 organic chemical whose releases and transfers increased in the latest year (from a little over 1 million pounds in 1995 to 2 million pounds in 1996).

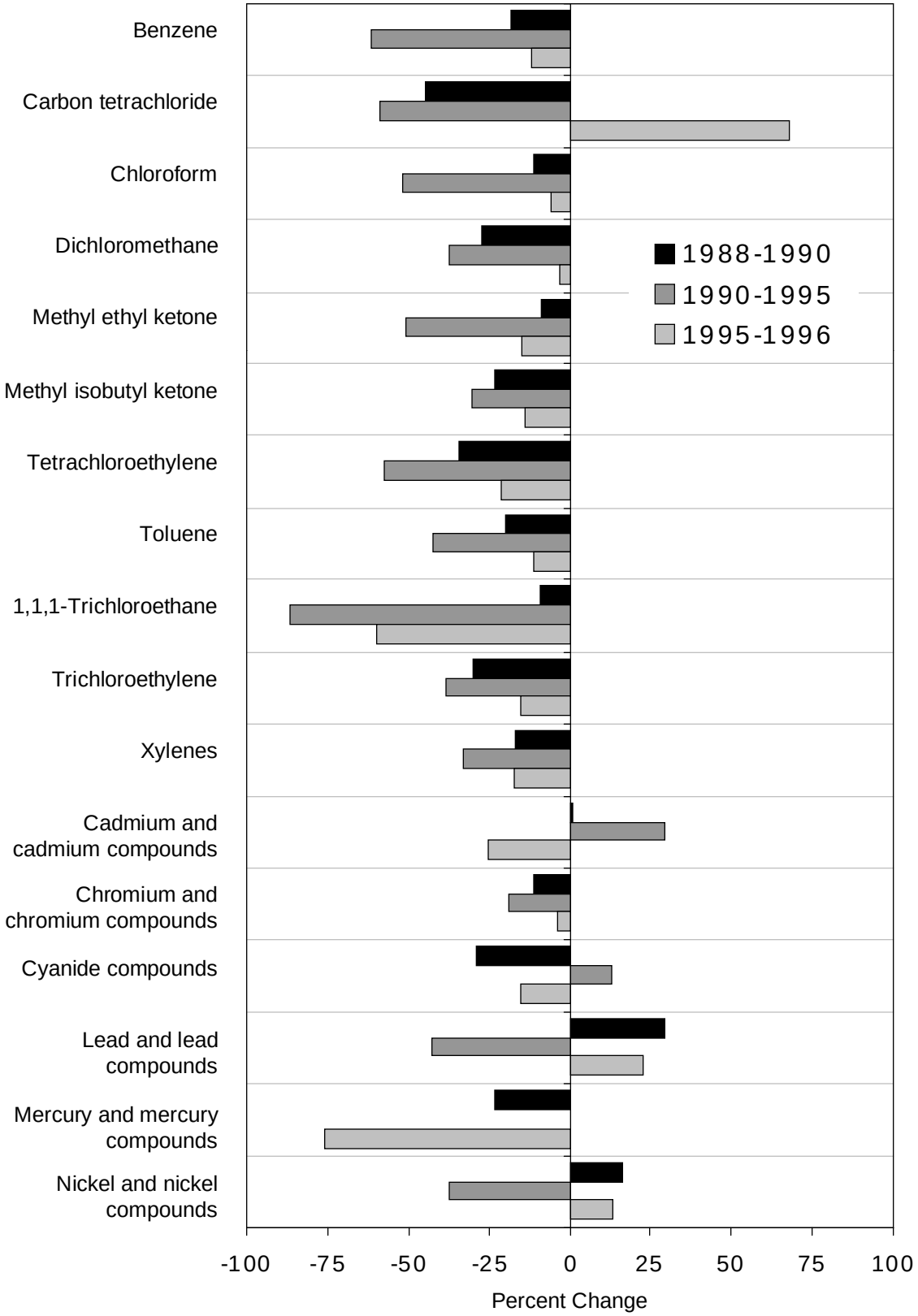
As shown in Figure 9, the two ozone-depleters posted the greatest percentage reductions in releases and transfers of 33/50 Program chemicals from 1990 to 1996. While other 33/50 Program chemicals decreased 40% from 1990 to 1995 and 9% in 1996, releases and transfers of carbon tetrachloride and TCA decreased 86% during the 33/50 Program years and 54% in the year after. Even though the ozone depleters accounted for such large reductions, the other 33/50 chemicals did meet the 50% reduction goal based on the 1988 baseline, as shown in Figure 10.

Figure 5. Releases and Transfers of 33/50 Program Chemicals by Chemical, 1988-1996



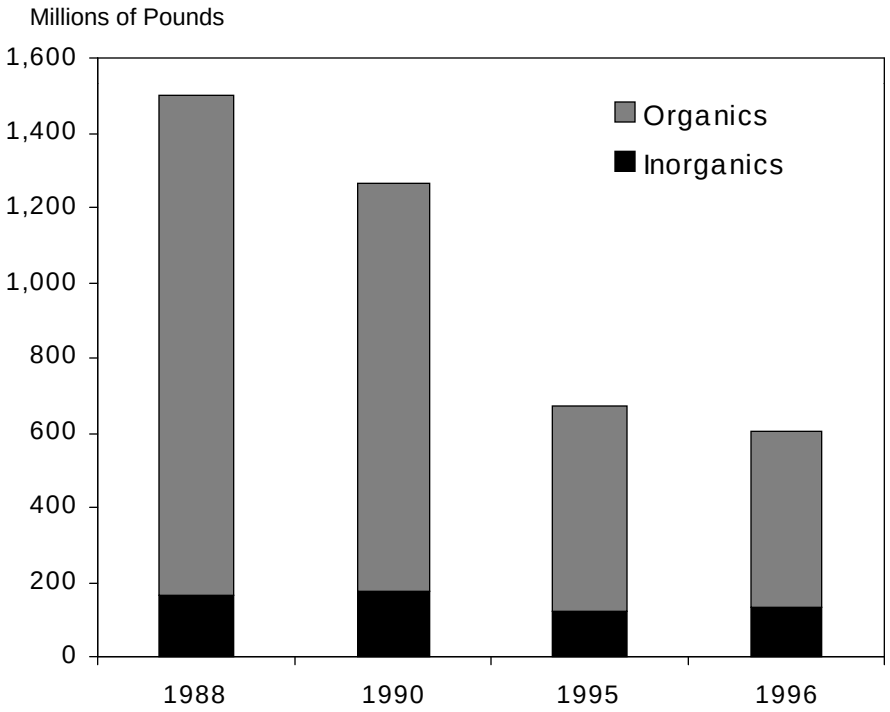
Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Figure 6. Percent Change in Releases and Transfers of 33/50 Program Chemicals by Chemical, 1988-1996



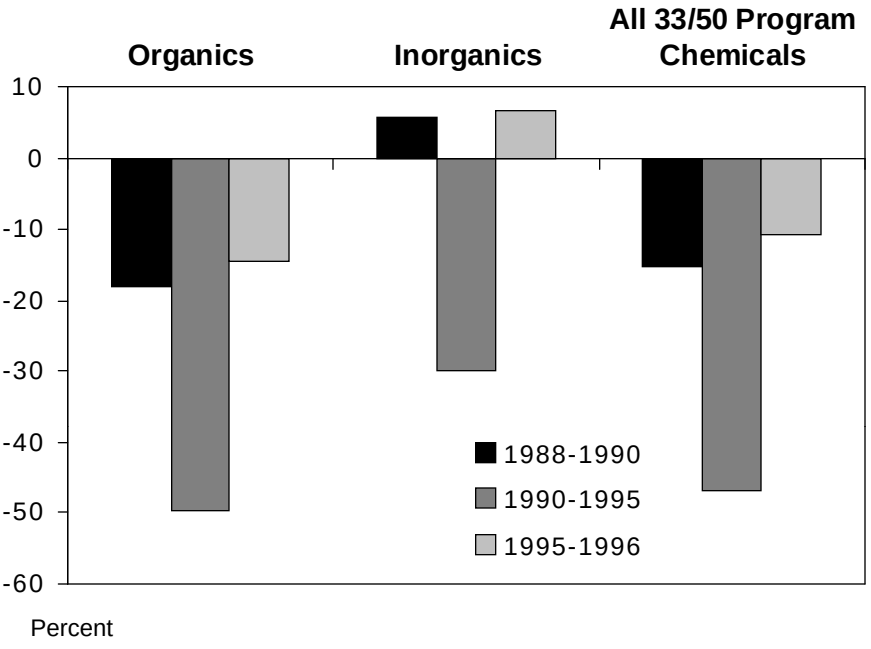
Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Figure 7. Releases and Transfers of 33/50 Program Chemicals: Organics and Inorganics, 1988-1996



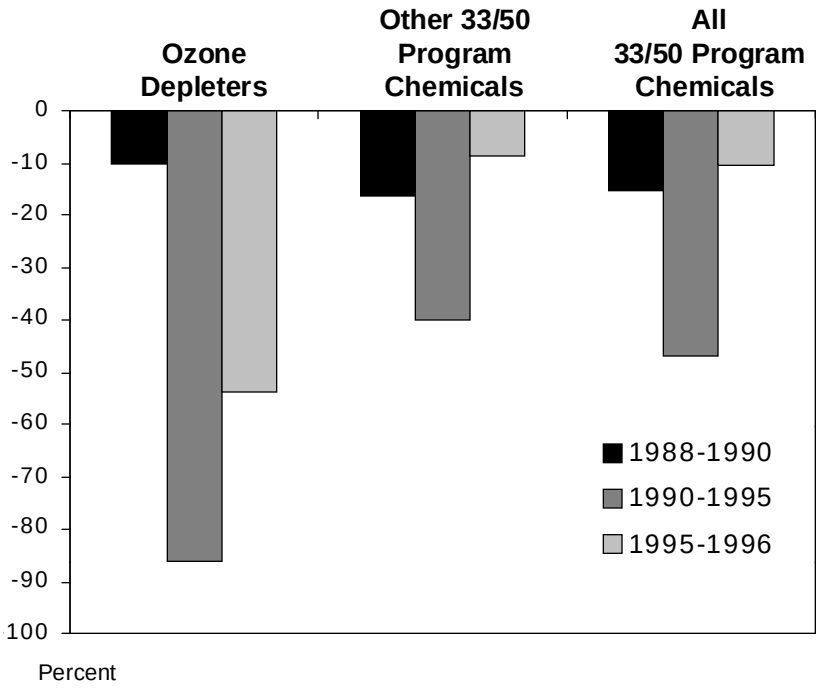
Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Figure 8. Percent Change in Releases and Transfers of 33/50 Program Chemicals: Organics vs. Inorganics, 1988-1996



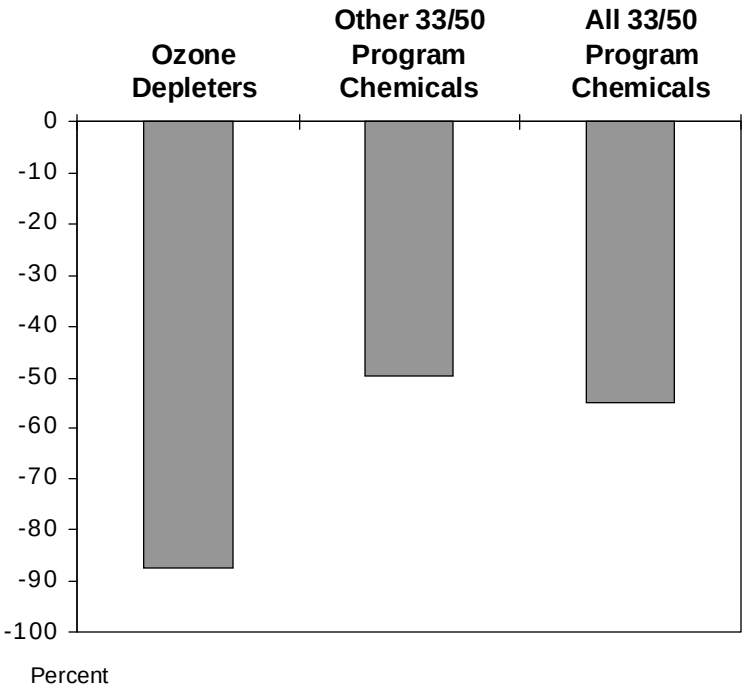
Note: Does not include delisted chemicals, chemicals added in 1990, 1991, 1994 and 1995, ammonia, aluminum oxide, hydrochloric acid, and sulfuric acid. Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Figure 9. Percent Change in Releases and Transfers of 33/50 Program Chemicals: Ozone Depleters vs. Others, 1988-1996



Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Figure 10. Percent Change in Releases and Transfers of 33/50 Program Chemicals: Ozone Depleters vs. Others, 1988-1995



Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Releases and Transfers by Type

Air emissions accounted for the great majority of releases and transfers of 33/50 chemicals and the great majority of reductions, as illustrated in Figure 11. From 1988 to 1996, total air emissions of 33/50 chemicals declined from 1.114 billion pounds to 407 million pounds. Fugitive air emissions declined 53% during 1990-1995 and point source air emissions decreased 47%, as illustrated in Figure 12.

Surface water discharges and transfers to POTWs also decreased by substantial percentages during 1990-1995. However, in 1996, surface water discharges, on-site releases to land, and off-site transfers to treatment increased. (Totals presented in Table 4 also summarize the 33/50 data by release and transfer type.)

Releases and Transfers by State

Thirty-four states met or exceeded the 33/50 Program's goal of a 50% reduction in releases and transfers of the targeted chemicals by 1995 (see Table 5). New Hampshire recorded the largest percentage decrease—87%. Five other states had reductions of more than 75% (Connecticut, Maine, New Jersey, New York, and Minnesota).

States with Largest Baseline Totals

Most of the states with the largest releases and transfers in 1988 met or exceeded the 50% goal (see Table 5). Ohio facilities reported releases and transfers totaling 103 million pounds for the 33/50 chemicals in 1988 and reduced that total to 37 million in 1995, a 64% reduction. Ranking first for releases and transfers of the 17 chemicals in 1988, Ohio ranked fifth in 1995 and again in 1996.

Ranking second for releases and transfers of 33/50 chemicals in 1988, Texas was one of the few large states whose reductions did not reach 50%. Texas facilities reported 101 million pounds in 1988 and 52 million pounds in 1995, a 48% reduction. Texas ranked first for total releases and transfers of 33/50 chemicals in 1995 and 1996.

Indiana ranked third in 1988 and second in 1995, although releases and transfers reported of the 33/50 chemicals in that state decreased 51% from 93 million pounds to 46 million pounds. A substantial decrease in 1996 (to 37 million pounds) returned Indiana to third place.

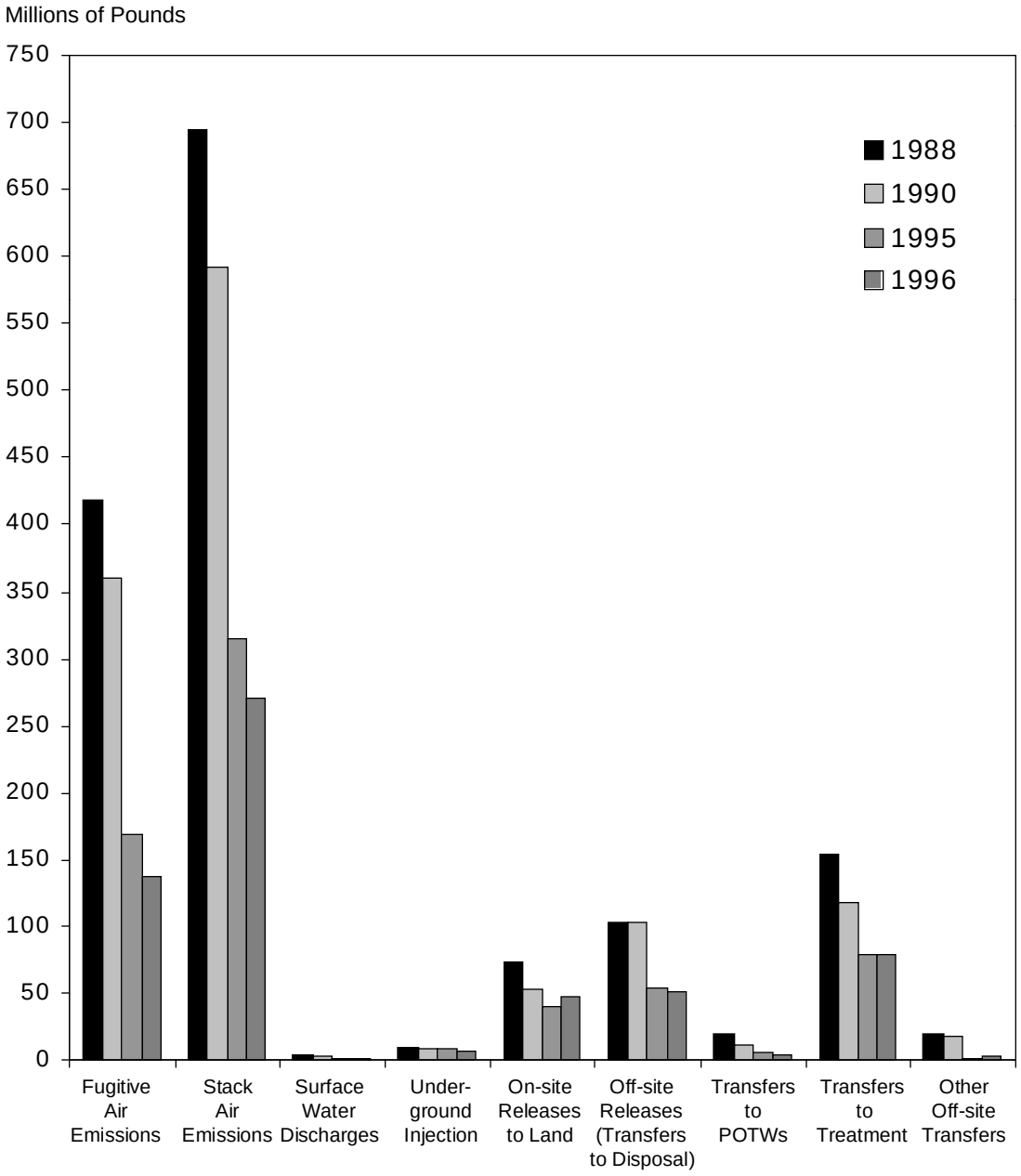
States with Increases

Releases and transfers fluctuated from year to year in the states with 1988-1995 increases (Idaho, Montana, and Nevada), as shown in Table 5. In Puerto Rico, however, releases and transfers decreased from a peak in 1991, although the 1988-1995 period shows a net increase. In 1996, Puerto Rico's releases and transfers fell below the territory's 1988 level.

Participants' Reductions by State

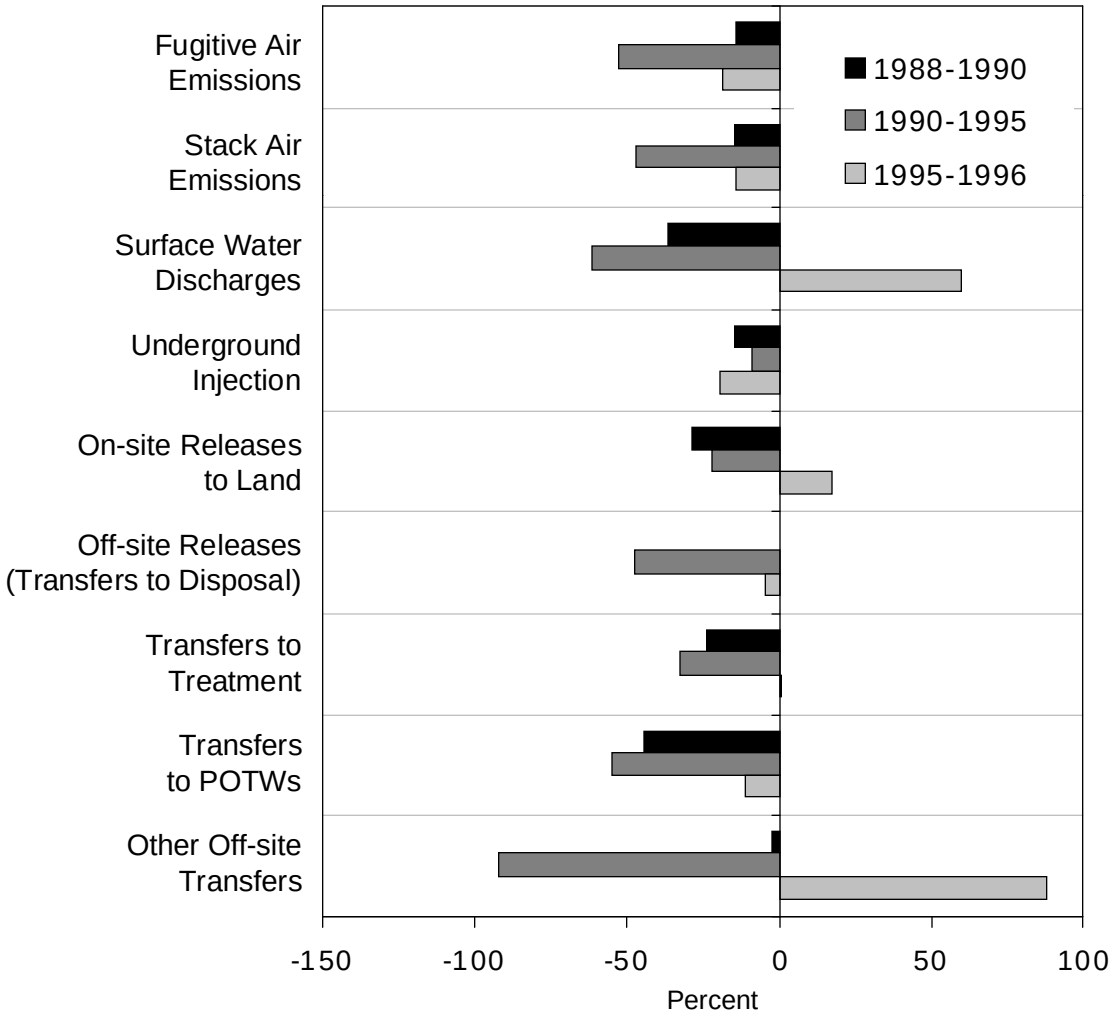
In 42 states and territories, participation in the 33/50 Program covered 50% or more of the 1988 baseline releases and transfers; the national average was nearly 63% (see Table 6). Participants accounted for more than 50% of the 1988-1995 reductions in all but 13 states and territories.

Figure 11. Releases and Transfers of 33/50 Program Chemicals by Release and Transfer Type, 1988-1996



Note: For 1995 and 1996, Other Off-site Transfers are transfers reported without a valid waste management code. For 1988 and 1990, Other Off-site Transfers are transfers reported without a valid waste management code or with codes not required to be reported in 1988 and 1990.

Figure 12. Percent Change in Releases and Transfers of 33/50 Program Chemicals by Release and Transfer Type, 1988-1996



Note: For 1995 and 1996, Other Off-site Transfers are transfers reported without a valid waste management code. For 1988 and 1990, Other Off-site Transfers are transfers reported without a valid waste management code or with codes not required to be reported in 1988 and 1990.

Table 5. Total Releases and Transfers of 33/50 Program Chemicals, by State, 1988-1996

(Ordered by Percent Change in Total Releases and Transfers in 1988-1995)

State	Facilities Number	1988 Pounds	1989 Pounds	1990 Pounds	1991 Pounds	1992 Pounds	1993 Pounds
New Hampshire	146	9,412,702	8,375,691	5,397,779	4,642,639	3,664,749	2,650,243
Connecticut	456	28,857,220	24,842,524	18,309,649	14,786,041	12,897,197	9,871,485
Maine	89	6,058,580	5,253,729	4,623,844	3,882,207	3,317,643	2,825,204
New Jersey	715	40,958,269	29,846,884	24,555,024	16,653,442	13,451,719	11,305,476
New York	835	72,901,207	57,482,474	48,028,631	37,291,601	30,614,394	24,197,981
Minnesota	420	42,508,085	54,927,940	40,463,852	29,505,736	20,489,553	14,658,011
Virgin Islands	1	1,876,864	1,851,717	1,576,047	1,486,406	1,327,407	1,021,654
Colorado	172	6,688,866	5,890,469	3,492,717	2,849,828	2,864,282	3,247,022
New Mexico	36	1,898,410	1,040,636	828,478	562,279	537,941	456,668
Massachusetts	589	26,020,336	23,241,555	20,532,682	14,790,342	12,778,115	9,849,327
Hawaii	11	390,357	328,382	291,781	181,153	227,854	181,376
Oklahoma	271	20,673,773	14,369,431	12,681,620	12,990,052	9,671,963	10,196,586
Ohio	1,595	102,994,911	101,586,886	80,711,836	74,586,574	54,319,379	47,906,513
Illinois	1,287	74,367,684	72,324,075	63,995,281	47,925,282	42,374,283	34,536,010
Vermont	41	1,685,915	1,155,146	1,033,627	1,164,216	663,899	761,672
Georgia	571	40,318,244	36,420,311	31,334,832	25,169,497	23,190,628	18,661,047
Rhode Island	195	6,311,793	5,284,318	4,269,758	3,357,100	2,860,440	2,821,293
Maryland	179	10,186,408	9,998,131	9,528,411	8,157,793	5,933,139	5,924,770
Wisconsin	809	38,016,229	37,406,686	31,737,444	25,876,708	22,629,725	19,258,762
Kansas	245	19,996,953	19,352,048	17,398,993	14,871,573	12,069,489	9,997,259
Washington	271	15,289,244	15,387,898	14,730,741	11,975,188	8,426,368	7,136,626
California	1,709	66,419,946	59,264,399	54,142,485	43,682,277	35,247,681	28,447,858
Delaware	52	4,054,007	5,209,099	2,796,794	2,496,105	1,936,235	2,263,134
Wyoming	24	953,940	672,417	889,625	659,367	498,104	187,748
Arkansas	320	23,907,993	23,025,085	20,901,924	15,401,530	16,437,472	13,167,389
Iowa	314	26,787,218	23,445,668	21,022,749	15,672,152	12,981,092	11,786,823
Utah	137	9,348,638	9,951,988	38,177,677	7,916,908	8,146,290	8,389,539
Florida	403	18,626,944	18,711,306	12,245,598	12,615,634	11,304,881	9,636,728
Louisiana	241	27,264,650	21,759,435	20,985,621	19,936,350	18,680,498	15,768,837
North Carolina	827	64,050,341	61,214,293	56,383,430	47,387,604	43,368,724	39,216,236
Virginia	416	39,484,549	35,268,887	32,911,282	25,818,542	24,177,285	23,112,533
Indiana	1,042	93,490,828	89,486,221	90,134,828	64,276,222	62,062,676	55,075,770
Missouri	549	45,709,472	43,132,705	37,800,727	29,189,654	27,490,072	33,537,745
Pennsylvania	1,220	92,335,028	81,622,954	70,596,766	55,592,619	50,860,044	51,076,375
Michigan	955	76,353,573	92,401,008	64,449,221	53,218,214	46,055,430	46,943,016
Texas	1,149	101,046,430	94,227,176	82,546,915	68,119,422	68,455,230	60,006,971
Alabama	425	37,208,385	39,065,185	34,341,643	29,663,579	25,541,445	23,376,220
South Carolina	422	30,702,486	36,671,192	29,447,295	24,872,839	22,863,962	18,793,643
Alaska	11	680,555	702,819	699,564	931,719	951,572	556,027
Kentucky	394	31,904,046	27,366,711	25,531,045	20,163,693	21,243,985	19,800,686
Nebraska	130	11,826,720	12,165,341	11,975,263	10,587,796	9,915,556	9,176,050
West Virginia	124	14,227,057	12,734,481	12,071,497	9,416,598	8,017,947	7,812,212
Arizona	206	11,618,062	8,708,548	8,718,241	9,921,249	6,868,017	3,416,348
Mississippi	300	32,652,804	30,893,528	28,853,310	26,225,553	24,793,124	24,888,493
Oregon	208	8,872,178	9,436,879	11,090,295	10,391,570	8,873,120	7,622,484
Tennessee	623	42,135,305	41,642,045	40,267,683	34,552,542	34,540,987	32,450,129
North Dakota	28	862,075	778,490	1,091,748	687,036	780,735	651,338
South Dakota	55	1,633,438	2,082,278	1,902,929	1,852,825	2,072,331	1,265,087
Puerto Rico	133	9,879,295	9,671,103	11,943,771	15,560,270	13,332,847	11,256,590
Nevada	38	728,119	631,159	732,980	573,915	607,219	670,310
Montana	20	2,905,146	3,832,754	3,932,293	3,799,227	4,084,254	4,572,033
Idaho	33	1,046,902	948,999	1,153,685	1,976,574	1,823,802	1,749,088
District of Columbia	2	0	0	0	0	0	0
American Samoa	1	0	0	0	0	0	16
Total	21,445	1,496,128,180	1,423,091,084	1,265,261,911	1,015,865,242	898,322,784	804,138,441

Table 5.

State	1994 Pounds	1995 Pounds	1996 Pounds	1988 Rank	1995 Rank	1996 Rank	1988-1990 Percent	1990-1995 Percent	1995-1996 Percent	1988-1995 Percent
New Hampshire	1,793,754	1,243,600	1,026,280	35	44	43	-42.7	-77.0	-17.5	-86.8
Connecticut	7,809,196	6,612,545	5,470,283	21	32	33	-36.6	-63.9	-17.3	-77.1
Maine	1,848,377	1,388,957	1,012,333	40	43	44	-23.7	-70.0	-27.1	-77.1
New Jersey	10,305,679	9,598,522	7,788,430	13	24	26	-40.0	-60.9	-18.9	-76.6
New York	23,200,070	17,258,814	16,604,938	7	15	12	-34.1	-64.1	-3.8	-76.3
Minnesota	12,998,645	10,100,607	8,813,595	11	23	23	-4.8	-75.0	-12.7	-76.2
Virgin Islands	837,084	511,850	475,063	44	49	46	-16.0	-67.5	-7.2	-72.7
Colorado	2,676,607	1,833,734	1,703,831	38	40	40	-47.8	-47.5	-7.1	-72.6
New Mexico	710,450	609,044	612,570	43	48	45	-56.4	-26.5	0.6	-67.9
Massachusetts	9,282,029	8,429,782	6,700,498	24	26	29	-21.1	-58.9	-20.5	-67.6
Hawaii	174,754	129,709	110,000	52	52	52	-25.3	-55.5	-15.2	-66.8
Oklahoma	9,160,815	7,177,823	6,173,363	26	30	31	-38.7	-43.4	-14.0	-65.3
Ohio	41,831,843	37,307,637	32,812,870	1	5	5	-21.6	-53.8	-12.0	-63.8
Illinois	34,827,295	28,626,034	26,655,514	6	8	8	-13.9	-55.3	-6.9	-61.5
Vermont	717,266	651,594	418,767	45	47	48	-38.7	-37.0	-35.7	-61.4
Georgia	19,059,383	15,622,852	15,536,402	14	17	15	-22.3	-50.1	-0.6	-61.3
Rhode Island	2,450,860	2,449,007	1,846,130	39	38	39	-32.4	-42.6	-24.6	-61.2
Maryland	5,315,775	3,968,625	3,528,669	33	37	37	-6.5	-58.3	-11.1	-61.0
Wisconsin	17,752,803	15,157,275	14,821,013	16	18	18	-16.5	-52.2	-2.2	-60.1
Kansas	9,322,220	8,061,786	8,614,252	27	28	24	-13.0	-53.7	6.9	-59.7
Washington	6,818,701	6,303,818	5,679,841	29	33	32	-3.7	-57.2	-9.9	-58.8
California	26,467,324	27,605,538	15,163,314	8	9	17	-18.5	-49.0	-45.1	-58.4
Delaware	2,464,029	1,717,015	1,157,224	41	41	41	-31.0	-38.6	-32.6	-57.6
Wyoming	185,455	406,162	390,102	48	50	49	-6.7	-54.3	-4.0	-57.4
Arkansas	12,420,528	10,439,837	9,626,696	25	21	21	-12.6	-50.1	-7.8	-56.3
Iowa	11,460,575	11,714,188	8,547,042	23	20	25	-21.5	-44.3	-27.0	-56.3
Utah	5,828,620	4,099,745	3,773,291	36	36	36	308.4	-89.3	-8.0	-56.1
Florida	8,053,918	8,378,209	7,267,703	28	27	27	-34.3	-31.6	-13.3	-55.0
Louisiana	12,990,691	12,994,315	11,988,715	22	19	19	-23.0	-38.1	-7.7	-52.3
North Carolina	34,470,435	30,912,432	29,861,939	9	6	6	-12.0	-45.2	-3.4	-51.7
Virginia	21,761,982	19,239,054	17,422,975	15	13	11	-16.6	-41.5	-9.4	-51.3
Indiana	49,682,861	46,067,097	37,406,777	3	2	3	-3.6	-48.9	-18.8	-50.7
Missouri	28,444,124	22,573,302	23,254,015	10	11	9	-17.3	-40.3	3.0	-50.6
Pennsylvania	47,790,534	46,017,673	44,278,501	4	3	2	-23.5	-34.8	-3.8	-50.2
Michigan	47,565,933	38,593,452	34,738,677	5	4	4	-15.6	-40.1	-10.0	-49.5
Texas	57,874,715	52,178,039	49,447,758	2	1	1	-18.3	-36.8	-5.2	-48.4
Alabama	21,353,276	19,989,895	16,163,640	17	12	13	-7.7	-41.8	-19.1	-46.3
South Carolina	16,853,513	16,515,561	15,490,127	20	16	16	-4.1	-43.9	-6.2	-46.2
Alaska	163,434	368,890	376,567	51	51	50	2.8	-47.3	2.1	-45.8
Kentucky	19,448,164	17,929,650	16,030,433	19	14	14	-20.0	-29.8	-10.6	-43.8
Nebraska	8,006,195	7,044,365	4,489,584	31	31	34	1.3	-41.2	-36.3	-40.4
West Virginia	8,685,399	8,650,266	7,142,615	30	25	28	-15.2	-28.3	-17.4	-39.2
Arizona	4,758,182	7,219,216	9,905,585	32	29	20	-25.0	-17.2	37.2	-37.9
Mississippi	24,292,050	22,679,312	19,084,603	18	10	10	-11.6	-21.4	-15.9	-30.5
Oregon	5,287,869	6,201,450	6,662,555	37	34	30	25.0	-44.1	7.4	-30.1
Tennessee	31,692,019	30,157,572	27,216,347	12	7	7	-4.4	-25.1	-9.8	-28.4
North Dakota	595,091	679,099	359,739	49	46	51	26.6	-37.8	-47.0	-21.2
South Dakota	1,439,472	1,415,800	1,055,341	46	42	42	16.5	-25.6	-25.5	-13.3
Puerto Rico	11,523,800	10,136,897	8,979,354	34	22	22	20.9	-15.1	-11.4	2.6
Nevada	794,058	801,310	432,628	50	45	47	0.7	9.3	-46.0	10.1
Montana	5,480,453	4,587,043	4,197,324	42	35	35	35.4	16.7	-8.5	57.9
Idaho	1,702,793	1,959,528	2,292,355	47	39	38	10.2	69.8	17.0	87.2
District of Columbia	5	255	255	53	53	53	—	—	0.0	—
American Samoa	0	0	0	54	54	54	—	—	—	—
Total	748,431,103	672,315,782	600,608,423				-15.4	-46.9	-10.7	-55.1

Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Table 6. Total Releases and Transfers of 33/50 Program Chemicals, by Participant Status, by State, 1988, 1990, 1995, 1996

State	Facilities Belonging to Participating Companies				
	Facilities	1988	1990	1995	1996
	Number	Pounds	Pounds	Pounds	Pounds
Alabama	130	25,587,729	22,516,857	11,126,048	8,050,679
Alaska	4	225,440	247,490	156,739	172,003
American Samoa	0	0	0	0	0
Arizona	64	7,050,550	5,678,138	4,859,628	6,466,583
Arkansas	101	9,219,303	6,602,636	3,252,636	2,979,685
California	512	37,802,128	26,037,244	15,546,207	6,647,765
Colorado	56	4,992,901	2,313,675	1,050,478	808,599
Connecticut	143	16,721,756	10,380,616	3,104,543	2,678,030
Delaware	27	3,511,407	2,299,082	1,520,461	994,981
District of Columbia	0	0	0	0	0
Florida	124	11,534,240	4,632,263	3,347,589	3,040,975
Georgia	206	23,973,134	18,226,264	8,299,927	7,902,395
Hawaii	6	390,107	290,876	129,454	109,995
Idaho	10	970,200	1,031,190	1,368,693	1,590,865
Illinois	380	38,684,120	31,106,928	11,268,113	8,827,064
Indiana	316	60,081,405	46,184,979	21,054,506	17,073,181
Iowa	103	18,110,898	13,801,505	5,548,493	3,433,601
Kansas	56	14,066,387	12,042,058	3,718,476	4,325,332
Kentucky	132	18,592,864	14,002,102	8,814,862	6,347,813
Louisiana	113	23,193,308	18,295,228	10,442,152	9,565,560
Maine	29	4,073,960	2,546,170	615,216	562,731
Maryland	72	7,484,751	6,044,807	2,138,326	2,297,196
Massachusetts	127	12,240,805	8,152,296	3,579,883	3,376,848
Michigan	348	54,756,186	42,483,727	25,243,714	22,752,597
Minnesota	140	35,337,853	32,407,085	5,846,221	5,305,102
Mississippi	100	16,146,387	12,287,041	7,895,973	8,374,618
Missouri	152	31,003,201	24,917,673	12,559,906	14,151,085
Montana	5	2,702,984	3,698,048	4,215,592	3,947,611
Nebraska	31	9,148,662	8,656,347	4,210,698	2,521,047
Nevada	9	124,214	296,176	90,018	64,609
New Hampshire	49	5,565,036	2,459,785	649,056	517,944
New Jersey	212	24,955,510	12,856,516	3,439,802	3,061,843
New Mexico	13	448,514	353,682	83,843	68,007
New York	229	49,305,586	29,346,401	8,780,907	8,764,904
North Carolina	294	36,680,755	32,387,896	17,746,024	17,361,221
North Dakota	7	476,952	624,640	397,717	211,952
Ohio	564	62,810,686	45,970,821	19,935,418	17,510,554
Oklahoma	68	16,447,443	9,262,906	3,872,129	3,273,899
Oregon	83	6,232,622	5,348,975	2,536,393	2,559,054
Pennsylvania	395	61,804,587	40,339,811	19,659,944	25,379,776
Puerto Rico	60	8,842,030	9,917,605	9,047,116	7,862,229
Rhode Island	26	1,469,957	738,468	284,261	201,779
South Carolina	149	18,085,094	16,567,747	8,141,453	8,070,532
South Dakota	10	1,074,960	1,211,790	551,996	510,129
Tennessee	202	16,777,047	15,949,346	7,102,398	6,504,942
Texas	385	64,115,483	51,424,789	25,921,980	23,083,299
Utah	41	5,605,503	36,973,232	3,096,905	2,024,139
Vermont	13	462,716	340,678	144,343	55,069
Virgin Islands	1	1,876,864	1,576,047	511,850	475,063
Virginia	143	23,337,908	18,833,844	8,268,081	6,807,387
Washington	103	12,556,289	11,796,597	4,838,191	4,185,047
West Virginia	47	10,740,939	8,798,655	5,873,051	5,187,391
Wisconsin	236	16,464,494	12,886,980	5,513,135	4,398,942
Wyoming	4	676,595	259,872	128,832	135,475
Total	6,830	934,540,450	743,405,584	337,529,377	302,579,127

Table 6.

State	Facilities Belonging to Non-Participating Companies					1988 Pounds from Participants
	Facilities	1988	1990	1995	1996	
	Number	Pounds	Pounds	Pounds	Pounds	Percent
Alabama	295	11,620,656	11,824,786	8,863,847	8,112,961	68.8
Alaska	7	455,115	452,074	212,151	204,564	33.1
American Samoa	1	0	0	0	0	—
Arizona	142	4,567,512	3,040,103	2,359,588	3,439,002	60.7
Arkansas	219	14,688,690	14,299,288	7,187,201	6,647,011	38.6
California	1,197	28,617,818	28,105,241	12,059,331	8,515,549	56.9
Colorado	116	1,695,965	1,179,042	783,256	895,232	74.6
Connecticut	313	12,135,464	7,929,033	3,508,002	2,792,253	57.9
Delaware	25	542,600	497,712	196,554	162,243	86.6
District of Columbia	2	0	0	255	255	—
Florida	279	7,092,704	7,613,335	5,030,620	4,226,728	61.9
Georgia	365	16,345,110	13,108,568	7,322,925	7,634,007	59.5
Hawaii	5	250	905	255	5	99.9
Idaho	23	76,702	122,495	590,835	701,490	92.7
Illinois	907	35,683,564	32,888,353	17,357,921	17,828,450	52.0
Indiana	726	33,409,423	43,949,849	25,012,591	20,333,596	64.3
Iowa	211	8,676,320	7,221,244	6,165,695	5,113,441	67.6
Kansas	189	5,930,566	5,356,935	4,343,310	4,288,920	70.3
Kentucky	262	13,311,182	11,528,943	9,114,788	9,682,620	58.3
Louisiana	128	4,071,342	2,690,393	2,552,163	2,423,155	85.1
Maine	60	1,984,620	2,077,674	773,741	449,602	67.2
Maryland	107	2,701,657	3,483,604	1,830,299	1,231,473	73.5
Massachusetts	462	13,779,531	12,380,386	4,849,899	3,323,650	47.0
Michigan	607	21,597,387	21,965,494	13,349,738	11,986,080	71.7
Minnesota	280	7,170,232	8,056,767	4,254,386	3,508,493	83.1
Mississippi	200	16,506,417	16,566,269	14,783,339	10,709,985	49.4
Missouri	397	14,706,271	12,883,054	10,013,396	9,102,930	67.8
Montana	15	202,162	234,245	371,451	249,713	93.0
Nebraska	99	2,678,058	3,318,916	2,833,667	1,968,537	77.4
Nevada	29	603,905	436,804	711,292	368,019	17.1
New Hampshire	97	3,847,666	2,937,994	594,544	508,336	59.1
New Jersey	503	16,002,759	11,698,508	6,158,720	4,726,587	60.9
New Mexico	23	1,449,896	474,796	525,201	544,563	23.6
New York	606	23,595,621	18,682,230	8,477,907	7,840,034	67.6
North Carolina	533	27,369,586	23,995,534	13,166,408	12,500,718	57.3
North Dakota	21	385,123	467,108	281,382	147,787	55.3
Ohio	1,031	40,184,225	34,741,015	17,372,219	15,302,316	61.0
Oklahoma	203	4,226,330	3,418,714	3,305,694	2,899,464	79.6
Oregon	125	2,639,556	5,741,320	3,665,057	4,103,501	70.2
Pennsylvania	825	30,530,441	30,256,955	26,357,729	18,898,725	66.9
Puerto Rico	73	1,037,265	2,026,166	1,089,781	1,117,125	89.5
Rhode Island	169	4,841,836	3,531,290	2,164,746	1,644,351	23.3
South Carolina	273	12,617,392	12,879,548	8,374,108	7,419,595	58.9
South Dakota	45	558,478	691,139	863,804	545,212	65.8
Tennessee	421	25,358,258	24,318,337	23,055,174	20,711,405	39.8
Texas	764	36,930,947	31,122,126	26,256,059	26,364,459	63.5
Utah	96	3,743,135	1,204,445	1,002,840	1,749,152	60.0
Vermont	28	1,223,199	692,949	507,251	363,698	27.4
Virgin Islands	0	0	0	0	0	100.0
Virginia	273	16,146,641	14,077,438	10,970,973	10,615,588	59.1
Washington	168	2,732,955	2,934,144	1,465,627	1,494,794	82.1
West Virginia	77	3,486,118	3,272,842	2,777,215	1,955,224	75.5
Wisconsin	573	21,551,735	18,850,464	9,644,140	10,422,071	43.3
Wyoming	20	277,345	629,753	277,330	254,627	70.9
Total	14,615	561,587,730	521,856,327	334,786,405	298,029,296	62.5

Note: Does not include amounts for transfers to recycling and energy recovery reported for 1991-1996.

Table 7. Total Production-related Waste, 33/50 Program Chemicals vs. Other TRI Chemicals, 1991-1998

Year	All TRI Chemicals Pounds	TRI Chemicals Less 33/50 Chemicals Pounds	33/50 Chemicals Only Pounds
1991	18,645,217,377	13,044,269,170	5,600,948,207
1995	18,768,661,434	13,268,464,615	5,500,196,819
1996	19,008,796,205	13,514,531,811	5,494,264,394
1998*	19,215,767,729	13,907,991,236	5,307,776,493
	Percent Change	**Percent Change**	**Percent Change**
1991-1995	0.7	1.7	-1.8
1995-1996	1.3	1.9	-0.1
1996-1998*	1.1	2.9	-3.4
1991-1998*	3.1	6.6	-5.2

* Projected amounts.

Note: Data for 1991-1995 from Form R of that year, data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

33/50 Program Chemicals in Waste

In contrast to the trend for TRI as a whole, facilities reported decreasing amounts of 33/50 chemicals in production-related waste since 1991. As shown in Table 7, production-related waste of 33/50 chemicals *decreased* nearly 2% from 1991 to 1995, while amounts reported for other TRI chemicals *increased* nearly 2%. As production-related waste of 33/50 chemicals decreased by more than 100 million pounds, production-related waste of other TRI chemicals grew by 224 million pounds. (Box 3 explains the production-related waste data added to TRI in 1991.)

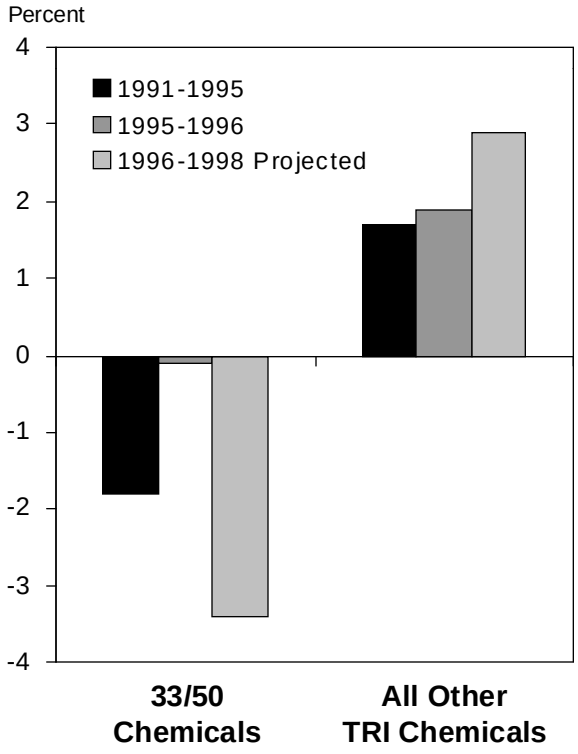
Box 3. Production-related Waste Data: A Larger View

Although the 33/50 Program measured only the original TRI release and transfer types, other TRI data collected in more recent years offers an expanded view of facilities' handling of the 33/50 chemicals. The federal Pollution Prevention Act of 1990 made mandatory the reporting of amounts of TRI chemicals: recycled on- or off-site combusted for energy recovery on- or off-site treated on- or off-site released on-site or sent off-site for disposal. Reporting of these data began with the 1991 reporting year. Taken together, these data are referred to as production-related waste. (Facilities report separately any releases arising from one-time events such as clean-up activities or accidents, referred to as non-production-related waste data.)

Each year, facilities report production-related waste data for the prior year and current year, along with projections for the next two years. This report uses the current year data from TRI forms submitted for each year from 1991 to 1996, along with the projected data for 1997 and 1998 from the 1996 reporting forms.

This diverging trend continued in 1996, and facilities projected even greater disparity in their expectations for managing smaller amounts of 33/50 chemicals and larger amounts of other TRI chemicals in production-related waste in the near future, as shown in Table 7 and Figure 13.

Figure 13. Percent Change in Total Production-Related Waste, 33/50 Chemicals vs. Other TRI Chemicals, 1991-1998



Note: Data for 1991-1995 from Form R of that year, data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

Production-related Waste by Chemical

Despite the trend for 33/50 chemicals overall, facilities reported increasing production-related waste from 1991 to 1995 for half of these chemicals. Tables 8 through 12 present production-related waste data by waste management method for each of the 33/50 Program chemicals. Figure 14 illustrates total production-related waste by chemical.

As with releases and transfers, the 33/50 chemical with the largest production-related waste was toluene, mostly recycled on site. Facilities reported 1.341 billion pounds of production-related waste for toluene in 1991, increasing to 1.702 billion pounds in 1995. The increase continued in 1996, to 1.816 billion pounds, and facilities projected a total of 1.838 billion pounds in 1998. (See Table 12.)

This and other increases were offset by sizable decreases from 1991 to 1995 in production-related waste of a few 33/50 chemicals. The largest reduction occurred in reporting for the ozone depleter 1,1,1-trichloroethane (TCA), again reflecting the influence of U.S. action to implement the Montreal Protocol. Facilities reported 324 million pounds of TCA in production-related waste in 1991 (about 40% in recycled on-site and about 40% released on- and off-site). This total dropped to 94 million pounds in 1995 and 53 million pounds in 1995. By 1998, facilities expect to report 17 million pounds of this chemical in production-related waste.

As shown in Figure 15, the 33/50 chemicals have varied considerably in the rate and direction of changes in production-related waste from 1991 through 1996 and projected to 1998. As with releases and transfers, organic chemicals have more consistently decreased in production-related waste than the inorganics.

Table 8. Quantity of 33/50 Program Chemicals Recycled On- and Off-site, by Chemical, 1991, 1995-1998

CAS Number	Chemical	1991	1995	1996	Projected Data 1997	Projected Data 1998
		Pounds	Pounds	Pounds	Pounds	Pounds
	Recycled On-site					
71-43-2	Benzene	40,330,807	57,794,042	61,704,353	60,669,170	60,705,707
56-23-5	Carbon tetrachloride	10,538,966	1,677,422	2,073,632	1,906,402	1,656,402
67-66-3	Chloroform	5,707,901	5,138,816	6,039,162	6,324,285	6,333,285
75-09-2	Dichloromethane	79,744,431	84,922,346	112,064,937	108,116,051	107,249,228
78-93-3	Methyl ethyl ketone	157,056,504	66,080,000	61,050,421	62,060,403	63,012,731
108-10-1	Methyl isobutyl ketone	69,883,266	52,704,238	52,337,198	66,360,080	66,296,709
127-18-4	Tetrachloroethylene	121,486,620	46,322,863	46,710,867	44,226,877	40,156,779
108-88-3	Toluene	614,412,320	1,006,140,873	968,269,305	1,010,078,968	1,017,604,101
71-55-6	1,1,1-Trichloroethane	128,353,853	60,014,479	39,529,212	32,595,781	12,330,942
79-01-6	Trichloroethylene	255,176,917	154,222,220	118,520,604	111,445,314	109,703,403
—	Xylenes	203,117,828	137,590,818	112,453,216	112,468,009	110,920,850
—	Cadmium and cadmium compounds	3,870,784	9,692,805	8,335,956	2,769,575	2,711,545
—	Chromium and chromium compounds	74,453,545	66,541,960	55,956,018	55,141,819	55,170,745
—	Cyanide compounds	3,815,457	737,110	661,943	553,789	494,347
—	Lead and compounds	743,863,516	713,073,994	605,496,338	579,257,877	560,059,222
—	Mercury and mercury compounds	1,283,428	1,045,196	850,230	984,310	972,648
—	Nickel and nickel compounds	50,378,431	52,171,803	42,663,278	44,019,558	44,118,066
	Subtotal for 33/50 Chemicals	2,563,474,574	2,515,870,985	2,294,716,670	2,298,978,268	2,259,496,710
	Subtotal for All Other TRI Chemicals	3,656,356,083	3,695,175,088	3,969,154,398	4,856,984,825	4,271,562,406
	Subtotal for All TRI Chemicals	6,219,830,657	6,211,046,073	6,263,871,068	7,155,963,093	6,531,059,116
	Recycled Off-site					
71-43-2	Benzene	1,415,909	427,633	532,733	434,805	332,958
56-23-5	Carbon tetrachloride	390,538	365,067	128,701	127,700	102,800
67-66-3	Chloroform	2,078,744	175,713	668,648	632,065	632,050
75-09-2	Dichloromethane	26,612,121	14,094,216	12,561,331	11,947,287	12,413,405
78-93-3	Methyl ethyl ketone	26,245,363	20,953,510	20,448,105	17,929,007	17,599,017
108-10-1	Methyl isobutyl ketone	17,975,240	16,350,554	13,920,201	13,752,220	13,537,873
127-18-4	Tetrachloroethylene	9,421,466	6,796,693	5,901,536	5,289,898	4,997,898
108-88-3	Toluene	25,264,073	25,011,874	26,647,879	20,982,633	20,973,822
71-55-6	1,1,1-Trichloroethane	29,756,436	3,739,900	1,414,057	758,954	399,018
79-01-6	Trichloroethylene	7,453,699	8,475,369	6,744,146	5,621,934	5,105,993
—	Xylenes	33,627,166	42,888,789	45,512,452	40,638,953	39,300,017
—	Cadmium and cadmium compounds	2,050,253	1,941,512	1,174,817	1,065,631	1,066,186
—	Chromium and chromium compounds	94,675,192	138,006,965	118,924,293	115,349,347	117,203,774
—	Cyanide compounds	38,243	32,526	29,182	23,800	23,516
—	Lead and compounds	278,777,579	359,686,596	353,752,318	325,718,298	328,077,352
—	Mercury and mercury compounds	491,812	58,151	25,898	60,400	59,600
—	Nickel and nickel compounds	81,710,636	111,492,001	114,466,306	111,414,242	112,554,268
	Subtotal for 33/50 Chemicals	637,984,470	750,497,069	722,852,603	671,747,174	674,379,547
	Subtotal for All Other TRI Chemicals	1,116,878,378	1,492,162,908	1,451,726,146	1,414,387,196	1,440,468,630
	Subtotal for All TRI Chemicals	1,754,862,848	2,242,659,977	2,174,578,749	2,086,134,370	2,114,848,177
	Total for 33/50 Chemicals	3,201,459,044	3,266,368,054	3,017,569,273	2,970,725,442	2,933,876,257
	Total for All Other TRI Chemicals	4,773,234,461	5,187,337,996	5,420,880,544	6,271,372,021	5,712,031,036
	Total for All TRI Chemicals	7,974,693,505	8,453,706,050	8,438,449,817	9,242,097,463	8,645,907,293

Note: Data for 1991 and 1995 reported on Form R of year indicated; data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

Table 9. Quantity of 33/50 Program Chemicals Used for Energy Recovery On- and Off-site, by Chemical, 1991, 1995-1998

CAS Number	Chemical	1991	1995	1996	Projected Data 1997	Projected Data 1998
		Pounds	Pounds	Pounds	Pounds	Pounds
	Energy Recovery On-site					
71-43-2	Benzene	33,630,440	20,222,877	15,645,404	14,900,183	17,402,508
56-23-5	Carbon tetrachloride	5,964,156	317,149	1,050,017	984,200	984,200
67-66-3	Chloroform	5,499,527	17,187,219	8,887,218	10,348,865	10,361,909
75-09-2	Dichloromethane	14,270,049	5,240,223	5,598,974	5,727,238	6,013,446
78-93-3	Methyl ethyl ketone	94,696,111	112,447,288	92,654,090	84,570,755	86,690,561
108-10-1	Methyl isobutyl ketone	37,048,558	26,719,664	20,171,448	20,274,081	20,941,125
127-18-4	Tetrachloroethylene	4,023,584	8,622,647	2,647,705	2,018,984	2,063,958
108-88-3	Toluene	255,726,051	214,676,316	187,671,839	179,785,581	188,772,650
71-55-6	1,1,1-Trichloroethane	14,001,816	3,487,698	860,823	900,020	906,370
79-01-6	Trichloroethylene	6,188,130	2,514,155	2,050,829	1,705,000	1,705,000
—	Xylenes	216,300,956	163,671,511	161,504,489	163,053,277	165,697,632
—	Cadmium and cadmium compounds	0	29,191	0	0	0
—	Chromium and chromium compounds	0	9,825,558	61,449	56,204	56,204
—	Cyanide compounds	22,338,436	33,160,239	33,967,968	32,973,988	30,725,876
—	Lead and compounds	102,675	49,836	89,267	90,000	90,000
—	Mercury and mercury compounds	0	0	0	0	0
—	Nickel and nickel compounds	0	127	54,474	53,173	53,173
	Subtotal for 33/50 Chemicals	709,790,489	618,171,698	532,915,994	517,441,549	532,464,612
	Subtotal for All Other TRI Chemicals	2,249,269,143	2,082,581,986	2,072,635,394	2,169,524,725	2,145,338,150
	Subtotal for All TRI Chemicals	2,959,059,632	2,700,753,684	2,605,551,388	2,686,966,274	2,677,802,762
	Energy Recovery Off-site					
71-43-2	Benzene	4,933,970	1,580,039	2,204,652	2,155,878	1,964,893
56-23-5	Carbon tetrachloride	10,849	50,068	31,331	22,915	22,916
67-66-3	Chloroform	719,071	103,558	188,162	103,146	106,586
75-09-2	Dichloromethane	6,176,317	3,388,830	3,435,212	3,336,805	3,135,038
78-93-3	Methyl ethyl ketone	38,806,756	43,615,637	41,818,751	37,560,664	35,963,472
108-10-1	Methyl isobutyl ketone	19,385,339	18,118,398	18,430,551	16,747,761	15,772,446
127-18-4	Tetrachloroethylene	1,519,555	779,833	780,979	536,438	566,786
108-88-3	Toluene	87,521,529	78,500,570	93,076,963	84,555,907	85,514,070
71-55-6	1,1,1-Trichloroethane	3,995,994	1,037,361	348,248	157,016	70,324
79-01-6	Trichloroethylene	963,407	1,101,615	818,502	528,294	433,056
—	Xylenes	78,521,892	72,369,412	82,015,919	74,630,015	74,841,761
—	Cadmium and cadmium compounds	8,337	1,715	1,613	0	0
—	Chromium and chromium compounds	133,971	120,479	91,445	68,478	72,183
—	Cyanide compounds	24	3,593	353	320	320
—	Lead and compounds	62,936	70,272	76,326	73,717	72,060
—	Mercury and mercury compounds	3,241	61	41	37	33
—	Nickel and nickel compounds	4,449	3,576	31,419	32,263	31,916
	Subtotal for 33/50 Chemicals	242,767,637	220,845,017	243,350,467	220,509,654	218,567,860
	Subtotal for All Other TRI Chemicals	201,259,315	257,430,339	241,641,168	219,879,822	219,082,411
	Subtotal for All TRI Chemicals	444,026,952	478,275,356	484,991,635	440,389,476	437,650,271
	Total for 33/50 Chemicals	952,558,126	839,016,715	776,266,461	737,951,203	751,032,472
	Total for All Other TRI Chemicals	2,450,528,458	2,340,012,325	2,314,276,562	2,389,404,547	2,364,420,561
	Total for All TRI Chemicals	3,403,086,584	3,179,029,040	3,090,543,023	3,127,355,750	3,115,453,033

Note: Data for 1991 and 1995 reported on Form R of year indicated; data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

Table 10. Quantity of 33/50 Program Chemicals Treated On- and Off-site, by Chemical, 1991, 1995-1998

CAS Number	Chemical	1991	1995	1996	Projected Data 1997	Projected Data 1998
		Pounds	Pounds	Pounds	Pounds	Pounds
	Treated On-site					
71-43-2	Benzene	32,067,226	55,735,616	64,991,646	59,577,676	59,116,134
56-23-5	Carbon tetrachloride	15,122,884	52,783,870	41,816,616	42,205,121	42,238,453
67-66-3	Chloroform	24,839,106	17,351,138	13,453,310	14,001,864	14,090,384
75-09-2	Dichloromethane	33,978,595	25,514,607	23,207,510	24,684,390	29,582,174
78-93-3	Methyl ethyl ketone	58,058,042	69,359,019	68,944,661	69,976,106	72,541,960
108-10-1	Methyl isobutyl ketone	12,147,639	17,795,698	13,243,777	13,806,925	13,647,578
127-18-4	Tetrachloroethylene	14,684,082	26,279,022	20,674,831	20,082,270	20,070,085
108-88-3	Toluene	134,144,622	214,503,254	395,302,542	394,189,641	397,061,193
71-55-6	1,1,1-Trichloroethane	3,211,986	1,108,250	1,184,611	828,183	831,233
79-01-6	Trichloroethylene	4,886,629	5,218,927	5,358,265	4,626,880	4,627,406
—	Xylenes	51,584,079	87,865,970	410,547,756	409,625,802	409,558,080
—	Cadmium and cadmium compounds	712,235	178,286	136,455	96,976	97,244
—	Chromium and chromium compounds	35,046,595	94,612,244	5,735,179	5,966,385	7,026,481
—	Cyanide compounds	17,222,170	34,246,658	38,289,394	40,477,384	40,633,006
—	Lead and compounds	42,264,660	30,625,916	3,753,868	4,278,198	5,008,415
—	Mercury and mercury compounds	35,755	6,307	4,115	4,249	4,249
—	Nickel and nickel compounds	2,576,531	7,173,959	3,716,271	3,471,838	3,475,021
	Subtotal for 33/50 Chemicals	482,582,836	740,358,741	1,110,360,807	1,107,899,888	1,119,609,096
	Subtotal for All Other TRI Chemicals	3,874,586,668	4,125,157,946	4,165,747,759	4,152,974,633	4,289,446,442
	Subtotal for All TRI Chemicals	4,357,169,504	4,865,516,687	5,276,108,566	5,260,874,521	5,409,055,538
	Treated Off-site					
71-43-2	Benzene	2,168,142	1,974,730	2,368,827	1,850,652	1,975,873
56-23-5	Carbon tetrachloride	840,947	730,882	498,915	501,246	479,652
67-66-3	Chloroform	2,086,756	2,061,635	2,780,057	1,613,348	1,575,925
75-09-2	Dichloromethane	11,123,271	11,801,587	12,605,351	12,083,445	11,743,246
78-93-3	Methyl ethyl ketone	8,547,414	6,341,958	5,660,666	5,221,744	5,252,409
108-10-1	Methyl isobutyl ketone	2,620,175	1,902,631	1,741,856	1,420,446	1,346,827
127-18-4	Tetrachloroethylene	3,352,387	2,285,968	1,569,624	1,466,346	1,417,591
108-88-3	Toluene	15,560,453	19,526,266	19,431,352	14,810,561	15,641,224
71-55-6	1,1,1-Trichloroethane	5,521,652	1,340,192	958,429	742,707	644,708
79-01-6	Trichloroethylene	2,602,508	2,305,131	1,725,639	1,316,901	1,145,582
—	Xylenes	11,722,189	10,888,289	10,323,599	8,688,379	8,272,873
—	Cadmium and cadmium compounds	337,522	194,096	116,095	99,008	97,759
—	Chromium and chromium compounds	5,066,706	5,171,667	4,668,019	4,326,599	4,185,019
—	Cyanide compounds	486,712	723,846	604,489	619,243	469,723
—	Lead and compounds	5,435,977	9,294,201	9,551,127	6,249,640	5,600,405
—	Mercury and mercury compounds	65,832	15,526	11,428	4,651	4,489
—	Nickel and nickel compounds	2,460,236	2,340,992	2,987,341	2,756,380	2,798,618
	Subtotal for 33/50 Chemicals	79,998,879	78,899,597	77,602,814	63,771,296	62,651,923
	Subtotal for All Other TRI Chemicals	356,542,529	323,923,649	306,010,840	315,556,643	312,158,199
	Subtotal for All TRI Chemicals	436,541,408	402,823,246	383,613,654	379,327,939	374,810,122
	Total for 33/50 Chemicals	562,581,715	819,258,338	1,187,963,621	1,171,671,184	1,182,261,019
	Total for All Other TRI Chemicals	4,231,129,197	4,449,081,595	4,471,758,599	4,468,531,276	4,601,604,641
	Total for All TRI Chemicals	4,793,710,912	5,268,339,933	5,659,722,220	5,640,202,460	5,783,865,660

Note: Data for 1991 and 1995 reported on Form R of year indicated; data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

Table 11. Quantity of 33/50 Program Chemicals Released On- and Off-site, by Chemical, 1991, 1995-1998

CAS Number	Chemical	1991	1995	1996	Projected Data 1997	Projected Data 1998
		Pounds	Pounds	Pounds	Pounds	Pounds
71-43-2	Benzene	19,159,539	10,082,333	8,663,103	7,943,851	7,481,050
56-23-5	Carbon tetrachloride	1,651,819	436,696	391,948	392,086	379,392
67-66-3	Chloroform	19,936,188	10,608,511	9,639,525	9,221,731	8,904,686
75-09-2	Dichloromethane	79,908,700	59,293,156	54,217,625	45,862,340	36,112,126
78-93-3	Methyl ethyl ketone	106,528,325	70,044,998	60,360,784	55,412,117	51,940,941
108-10-1	Methyl isobutyl ketone	28,871,798	22,514,059	19,396,559	17,733,383	16,766,594
127-18-4	Tetrachloroethylene	16,780,980	9,532,831	7,684,495	5,572,755	4,814,403
108-88-3	Toluene	208,062,592	143,601,866	125,826,351	119,221,350	112,471,568
71-55-6	1,1,1-Trichloroethane	139,346,666	22,881,795	8,629,523	4,523,356	1,808,565
79-01-6	Trichloroethylene	35,269,942	25,748,239	21,684,499	16,342,966	12,671,660
—	Xylenes	130,062,885	104,478,046	93,376,563	88,407,931	86,685,907
—	Cadmium and cadmium compounds	1,553,222	2,074,375	1,535,526	1,664,818	1,571,133
—	Chromium and chromium compounds	42,033,493	43,949,895	44,836,785	44,168,722	44,367,894
—	Cyanide compounds	7,146,331	8,824,676	7,393,041	6,128,054	5,893,849
—	Lead and compounds	36,432,035	30,652,707	35,691,638	37,342,858	36,130,177
—	Mercury and mercury compounds	103,049	43,618	47,937	47,195	46,787
—	Nickel and nickel compounds	11,501,758	10,785,911	13,089,137	12,452,649	12,560,013
	Total for 33/50 Chemicals	884,349,322	575,553,712	512,465,039	472,438,162	440,606,745
	Total for All Other TRI Chemicals	1,589,377,054	1,292,032,699	1,307,616,106	1,291,446,766	1,229,934,998
	Total for All TRI Chemicals	2,473,726,376	1,867,586,411	1,820,081,145	1,763,884,928	1,670,541,743

Note: Data for 1991 and 1995 reported on Form R of year indicated; data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

Table 12. Quantity of 33/50 Program Chemicals in Production-related Waste, by Chemical, 1991, 1995-1998

CAS Number	Chemical	1991	1995	1996	Projected Data 1997	Projected Data 1998
		Pounds	Pounds	Pounds	Pounds	Pounds
71-43-2	Benzene	133,706,033	147,817,270	156,110,718	147,532,215	148,979,123
56-23-5	Carbon tetrachloride	34,520,159	56,361,154	45,991,160	46,139,670	45,863,815
67-66-3	Chloroform	60,867,293	52,626,590	41,656,082	42,245,304	42,004,825
75-09-2	Dichloromethane	251,813,484	204,254,965	223,690,940	211,757,556	206,248,663
78-93-3	Methyl ethyl ketone	489,938,515	388,842,410	350,937,478	332,730,796	333,001,091
108-10-1	Methyl isobutyl ketone	187,932,015	156,105,242	139,241,590	150,094,896	148,309,152
127-18-4	Tetrachloroethylene	171,268,674	100,619,857	85,970,037	79,193,568	74,087,500
108-88-3	Toluene	1,340,691,640	1,701,961,019	1,816,226,231	1,823,624,641	1,838,038,628
71-55-6	1,1,1-Trichloroethane	324,188,403	93,609,675	52,924,903	40,506,017	16,991,160
79-01-6	Trichloroethylene	312,541,232	199,585,656	156,902,484	141,587,289	135,392,100
—	Xylenes	724,936,995	619,752,835	915,733,994	897,512,366	895,277,120
—	Cadmium and cadmium compounds	8,532,353	14,111,980	11,300,462	5,696,008	5,543,867
—	Chromium and chromium compounds	251,409,502	358,228,768	230,273,188	225,077,554	228,082,300
—	Cyanide compounds	51,047,373	77,728,648	80,946,370	80,776,578	78,240,637
—	Lead and compounds	1,106,939,378	1,143,453,522	1,008,410,882	953,010,588	935,037,631
—	Mercury and mercury compounds	1,983,117	1,168,859	939,649	1,100,842	1,087,806
—	Nickel and nickel compounds	148,632,041	183,968,369	177,008,226	174,200,103	175,591,075
	Total for 33/50 Chemicals	5,600,948,207	5,500,196,819	5,494,264,394	5,352,785,991	5,307,776,493
	Total for All Other TRI Chemicals	13,044,269,170	13,268,464,615	13,514,531,811	14,420,754,610	13,907,991,236
	Total for All TRI Chemicals	18,645,217,377	18,768,661,434	19,008,796,205	19,773,540,601	19,215,767,729

Note: Data for 1991 and 1995 reported on Form R of year indicated; data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

Figure 14. Total Production-related Waste of 33/50 Program Chemicals, by Chemical, Actual and Projected, 1991, 1995-1998

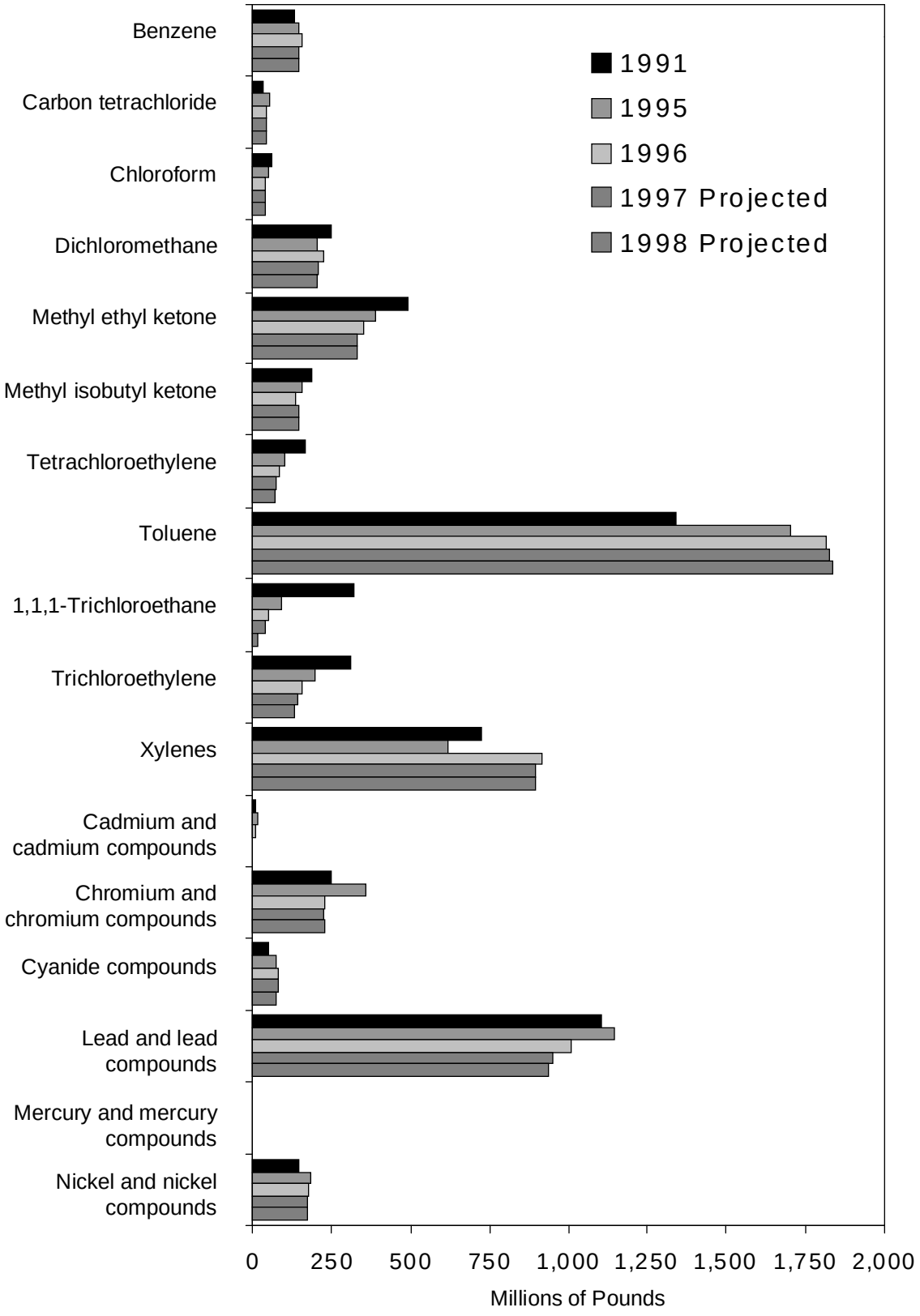
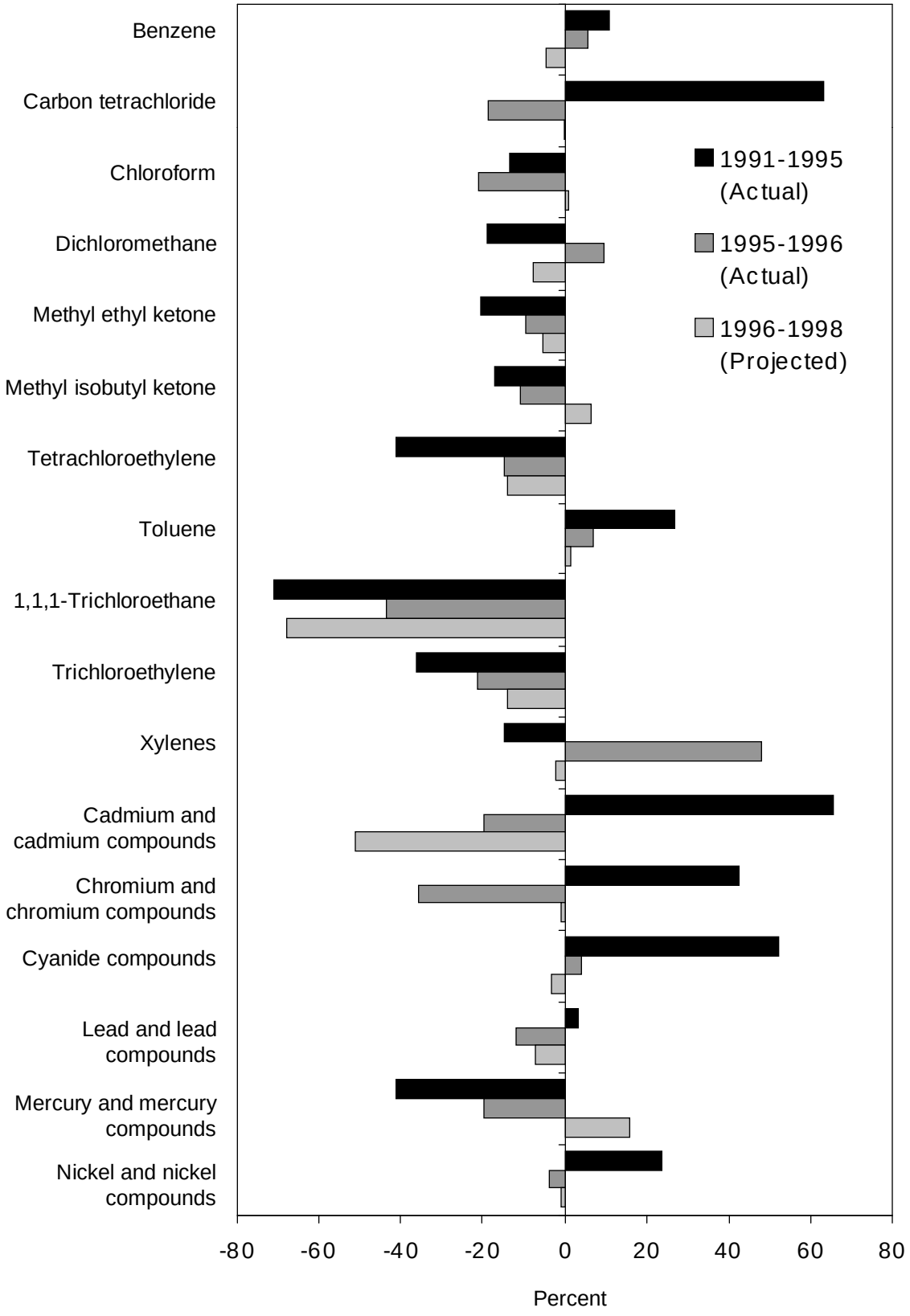


Figure 15. Percent Change in Production-related Waste of 33/50 Program Chemicals, by Chemical, Actual and Projected, 1991-1998



Production-related Waste by Management Method

From 1991 to 1995, facilities cut their releases on- and off-site of 33/50 chemicals from 884 million pounds to 576 million pounds (see Table 11). This was the largest reduction (309 million pounds) among the waste management options comprised by production-related waste. Reducing releases also represents the most environmentally desirable option, as established in the waste management hierarchy (Box 4).

Combustion of 33/50 chemicals for energy recovery on- and off-site decreased by 114 million pounds over the 1991-to-1995 period. Although on-site recycling also decreased, this change was more than offset by a substantial increase in recycling off-site. Altogether, recycling of 33/50 chemicals increased by 65 million pounds from 1991 to 1995.

Facilities also reported larger amounts of treatment of the 33/50 chemicals, an increase of 257 million pounds. Except for recycling, these trends generally continued in 1996 and were expected to extend through 1998, as seen in Tables 8 through 12.

Figure 16 illustrates these changes in absolute terms, and Figure 17 illustrates the percentage changes for 1991 through 1998 (projected).

The data suggest that facilities accomplished reductions in releases largely by increasing their use of treatment options and that they plan to continue this pattern. Although treating toxic chemicals in waste is preferable to releasing them to the environment, treatment offers less potential environmental benefit than recycling, energy recovery, or prevention.

Source Reduction Activity

TRI facilities also indicate whether, during the year, they engaged in source reduction activities focused on the chemical they are reporting. Source reduction activities reduce the amount of the chemical entering the waste stream (before any recycling, treatment, or disposal)—that is, source reduction reduces pollution by preventing it at the

Box 4. Waste Management Hierarchy

The federal Pollution Prevention Act of 1990 established source reduction—preventing the generation of toxic chemicals in waste at their source—as the preferred approach waste management. This national policy also established a hierarchy of options for situations where source reduction is not feasible:

- For waste that cannot be prevented, recycling is the preferred option.
- Because combustion of waste for energy recovery shares some aspects with other approaches, EPA added energy recovery to the hierarchy.
- For waste that cannot be recycled or burned for energy recovery, the next preferred option is treatment.
- Release or disposal of the chemical is viewed as a last resort, to be employed only when preferred methods cannot be implemented.

Figure 16. Quantities of 33/50 Program Chemicals Managed in Waste, by Management Method, Actual and Projected, 1991, 1995-1998

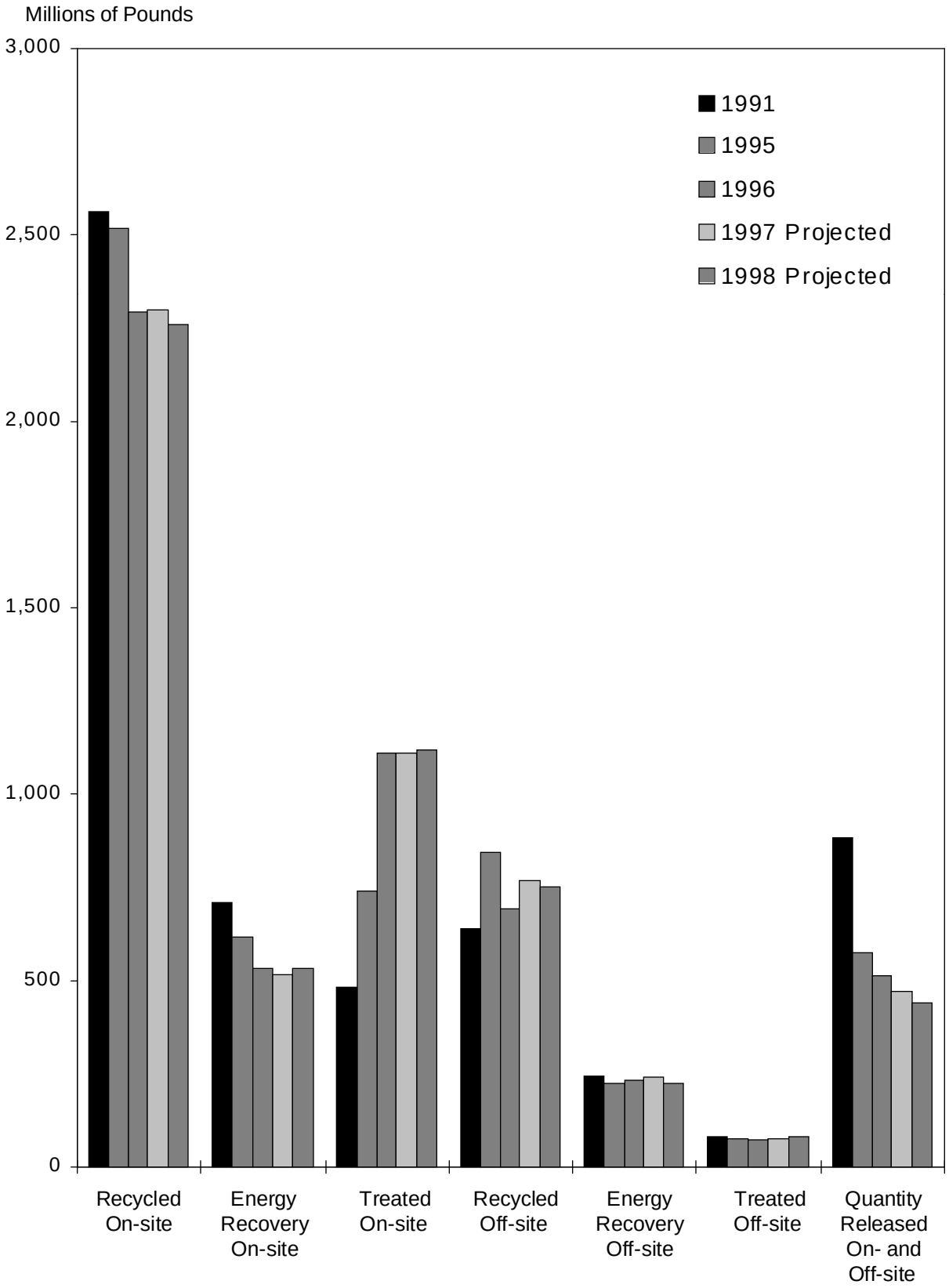
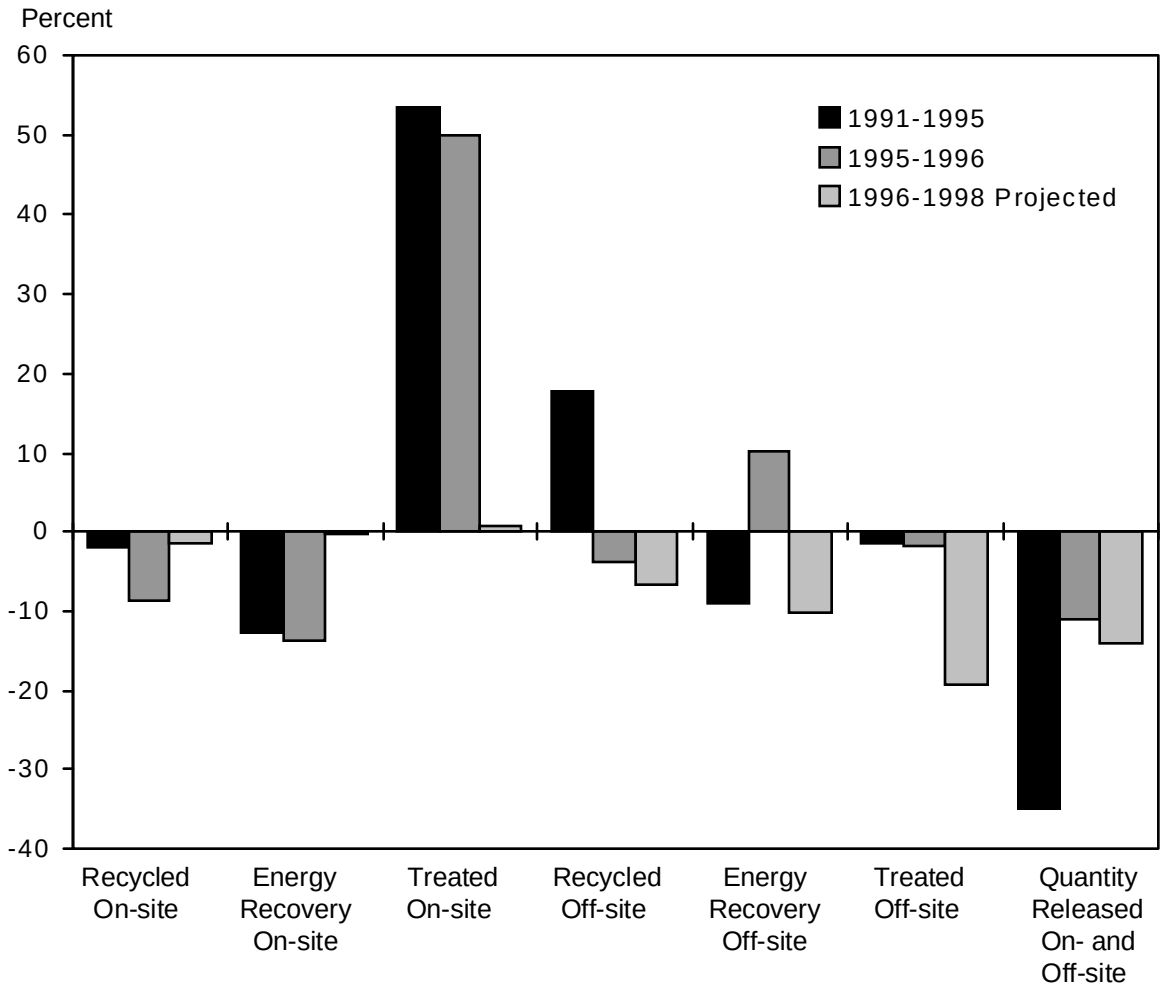


Figure 17. Percent Change in Waste Management Methods, 33/50 Program Chemicals, 1991-1998



source. The 33/50 Program encouraged participants to apply pollution prevention approaches to reducing their releases and transfers of the targeted chemicals.

In 1991, the first year of the 33/50 Program, one-third (33%) of all TRI forms for 33/50 chemicals indicated that source reduction activities were underway, compared to less than one-quarter (22%) of forms reporting other TRI chemicals, as shown in Table 13. By 1995 (and again in 1996), both percentages had declined, but 33/50 chemicals continued to demonstrate a considerable lead over other TRI chemicals for reporting of source reduction activity. Figure 18 illustrates this trend.

Forms indicating source reduction activity directed at 33/50 chemicals reported 2.516 billion pounds of production-related waste in 1991—45% of all production-related waste of these chemicals, as shown in Table 14. For other TRI chemicals, forms indicating source reduction activity accounted for 4.248 billion pounds of production-related waste—33% of all production-related waste of these chemicals.

These amounts and percentages fluctuated through 1996, as illustrated in Figure 19, but in all years forms indicating source reduction activity were associated with a larger percentage of the production-related waste for 33/50 chemicals than for non-33/50 TRI chemicals.

Table 13. Number of Forms Reporting Source Reduction Activity, by 33/50 Program Chemical, 1991-1996

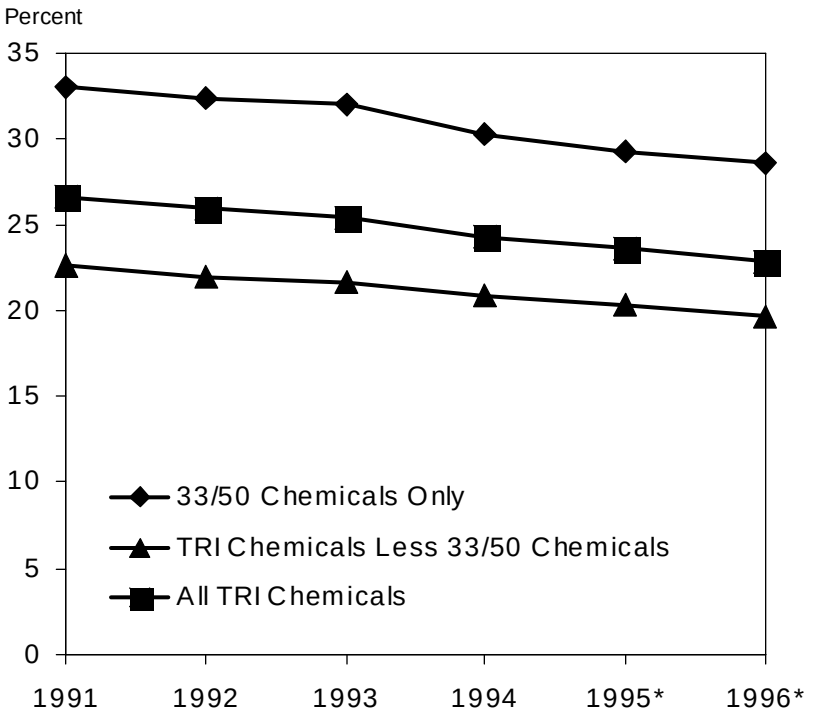
CAS Number	Chemical	Forms Reporting Source Reduction Activity					
		1991 Number	1992 Number	1993 Number	1994 Number	1995* Number	1996* Number
71-43-2	Benzene	155	154	143	138	118	111
56-23-5	Carbon tetrachloride	29	27	18	14	11	8
67-66-3	Chloroform	68	62	54	41	36	31
75-09-2	Dichloromethane	525	422	384	348	308	307
78-93-3	Methyl ethyl ketone	976	923	926	924	843	779
108-10-1	Methyl isobutyl ketone	387	363	342	361	342	287
127-18-4	Tetrachloroethylene	216	193	179	173	136	122
108-88-3	Toluene	1,506	1,459	1,395	1,358	1,241	1,143
71-55-6	1,1,1-Trichloroethane	1,619	1,505	1,174	600	364	192
79-01-6	Trichloroethylene	291	248	289	276	268	247
—	Xylene (mixed isomers)	1,373	1,329	1,295	1,270	1,169	1,074
—	Cadmium and cadmium compounds	62	65	65	58	46	34
—	Chromium and chromium compounds	608	577	581	559	458	451
—	Cyanide compounds	95	86	81	76	69	55
—	Lead and lead compounds	487	445	432	423	349	335
—	Mercury and mercury compounds	12	8	10	9	6	8
—	Nickel and nickel compounds	387	364	401	404	370	365
Total for All 33/50 Chemicals		8,796	8,230	7,769	7,032	6,134	5,549
Total for All Other TRI Chemicals		9,579	9,216	8,984	8,548	7,371	6,850
Total for All TRI Chemicals		18,375	17,446	16,753	15,580	13,505	12,399

CAS Number	Chemical	Percent of Forms that Reported Source Reduction Activity					
		1991 Percent	1992 Percent	1993 Percent	1994 Percent	1995* Percent	1996* Percent
71-43-2	Benzene	31.8	32.2	30.1	27.9	26.5	25.3
56-23-5	Carbon tetrachloride	28.4	30.0	24.0	20.0	18.3	14.0
67-66-3	Chloroform	36.8	34.3	30.9	24.4	23.2	20.4
75-09-2	Dichloromethane	40.2	36.7	35.1	33.0	31.9	35.2
78-93-3	Methyl ethyl ketone	37.5	36.5	37.1	38.0	37.4	37.7
108-10-1	Methyl isobutyl ketone	36.9	34.7	33.2	34.5	34.7	32.4
127-18-4	Tetrachloroethylene	37.2	36.8	36.2	36.8	33.3	33.3
108-88-3	Toluene	37.8	37.8	37.7	37.2	37.2	36.7
71-55-6	1,1,1-Trichloroethane	43.2	46.6	55.0	48.4	48.1	52.5
79-01-6	Trichloroethylene	39.9	36.2	36.2	34.6	37.2	38.4
—	Xylene (mixed isomers)	35.7	35.6	35.3	35.3	35.0	34.4
—	Cadmium and cadmium compounds	28.4	34.4	35.9	36.0	33.8	27.9
—	Chromium and chromium compounds	19.3	18.0	17.6	16.9	15.5	16.1
—	Cyanide compounds	29.9	28.9	27.1	25.7	25.3	21.3
—	Lead and lead compounds	26.6	25.6	25.1	24.9	22.5	22.0
—	Mercury and mercury compounds	21.4	20.5	28.6	30.0	17.6	24.2
—	Nickel and nickel compounds	15.8	14.6	15.3	15.1	14.5	14.3
Total for All 33/50 Chemicals		33.0	32.3	32.0	30.3	29.3	28.6
Total for All Other TRI Chemicals		22.6	22.0	21.6	20.9	20.3	19.6
Total for All TRI Chemicals		26.6	25.9	25.4	24.3	23.6	22.8

***** Excludes Form As for 1995 and 1996, because Form As do not have a section for reporting source reduction activity.

Note: Data for 1991-1995 from Form R of that year, data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

Figure 18. Forms Reporting Source Reduction Activity: Percent of All Forms, 1991-1996



***** Excludes Form As for 1995 and 1996, because Form As do not have a section for reporting source reduction activity.

Note: Data for 1991-1995 from Form R of that year, data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

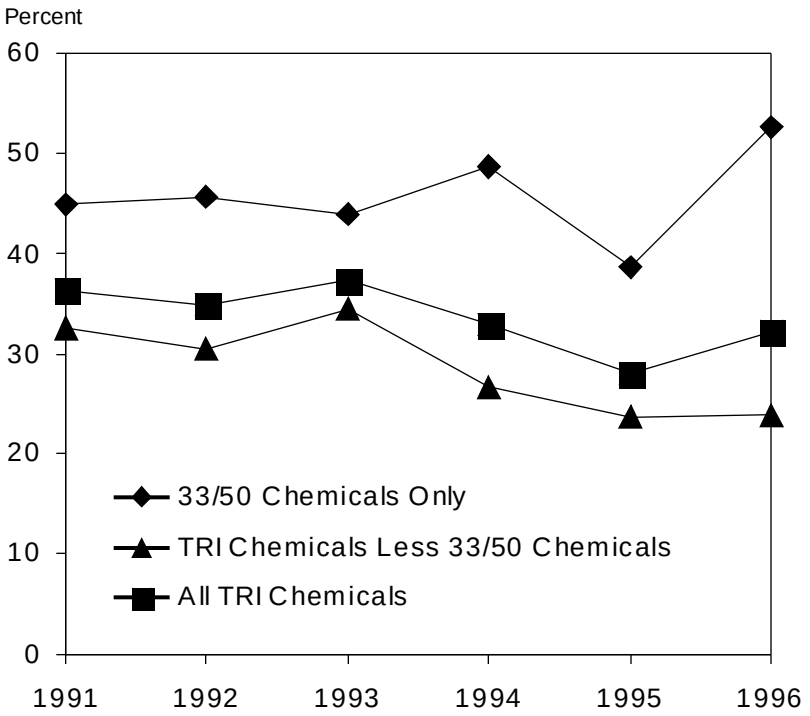
Table 14. Total Production-related Waste Associated with Forms Reporting Source Reduction Activity, by 33/50 Program Chemical, 1991-1996

CAS Number	Chemical	Production-related Waste for Forms Reporting Source Reduction Activities					
		1991 Pounds	1992 Pounds	1993 Pounds	1994 Pounds	1995 Pounds	1996 Pounds
71-43-2	Benzene	55,541,047	48,271,156	50,116,746	47,226,116	42,351,596	50,789,543
56-23-5	Carbon tetrachloride	21,472,069	21,904,852	2,167,531	4,949,907	2,427,702	1,913,230
67-66-3	Chloroform	14,379,245	17,802,334	16,802,153	9,816,081	9,275,483	6,169,203
75-09-2	Dichloromethane	125,381,084	146,975,826	84,827,231	76,938,954	77,585,595	79,414,777
78-93-3	Methyl ethyl ketone	198,150,861	179,106,128	186,643,138	194,537,334	171,744,564	157,549,155
108-10-1	Methyl isobutyl ketone	73,249,636	81,992,865	59,783,329	66,228,671	52,708,128	48,283,173
127-18-4	Tetrachloroethylene	80,127,157	63,984,879	66,826,328	44,448,208	26,328,679	22,689,926
108-88-3	Toluene	668,751,080	569,999,139	1,035,456,963	974,682,573	605,798,496	1,211,230,805
71-55-6	1,1,1-Trichloroethane	181,544,908	156,484,969	109,806,301	67,176,358	43,303,528	29,233,563
79-01-6	Trichloroethylene	132,625,293	198,273,894	110,470,925	95,133,361	72,122,475	56,105,799
—	Xylenes	346,779,530	249,069,319	253,667,965	227,559,955	193,507,016	483,583,899
—	Cadmium and cadmium compounds	2,336,581	4,134,595	3,947,679	3,950,110	2,820,850	1,287,657
—	Chromium and chromium compounds	55,361,196	34,051,155	21,977,369	86,757,892	20,704,574	30,003,427
—	Cyanide compounds	34,379,686	37,031,829	25,815,113	45,709,139	46,055,297	44,523,562
—	Lead and lead compounds	501,741,814	570,948,024	384,110,192	692,328,578	731,618,678	642,450,263
—	Mercury and mercury compounds	742,388	682,976	133,614	124,565	164,368	620,628
—	Nickel and nickel compounds	23,039,772	25,060,457	20,090,582	36,087,151	25,621,938	22,325,650
Total for 33/50 Chemicals		2,515,603,347	2,405,774,397	2,432,643,159	2,673,654,953	2,124,138,967	2,888,174,260
All Other TRI Chemicals		4,247,584,310	3,915,188,235	4,409,588,110	3,693,592,628	3,125,699,709	3,230,269,425
Total for All TRI Chemicals		6,763,187,657	6,320,962,632	6,842,231,269	6,367,247,581	5,249,838,676	6,118,443,685

CAS Number	Chemical	Percent of All Production-related Waste					
		1991 Percent	1992 Percent	1993 Percent	1994 Percent	1995 Percent	1996 Percent
71-43-2	Benzene	41.5	39.1	43.2	40.0	28.7	32.5
56-23-5	Carbon tetrachloride	62.2	56.0	8.3	26.1	4.3	4.2
67-66-3	Chloroform	23.6	31.7	31.6	19.4	17.6	14.8
75-09-2	Dichloromethane	49.8	62.9	41.5	38.7	38.0	35.5
78-93-3	Methyl ethyl ketone	40.4	48.0	47.8	50.4	44.2	44.9
108-10-1	Methyl isobutyl ketone	39.0	43.6	36.1	38.4	33.8	34.7
127-18-4	Tetrachloroethylene	46.8	48.4	53.5	40.5	26.2	26.4
108-88-3	Toluene	49.9	47.4	59.3	59.2	35.6	66.7
71-55-6	1,1,1-Trichloroethane	56.0	61.3	64.4	52.9	46.3	55.2
79-01-6	Trichloroethylene	42.4	72.2	32.3	31.6	36.1	35.8
—	Xylenes	47.8	40.1	37.2	34.7	31.2	52.8
—	Cadmium and cadmium compounds	27.4	26.0	37.8	38.8	20.0	11.4
—	Chromium and chromium compounds	22.0	11.9	6.4	24.6	5.8	13.0
—	Cyanide compounds	67.3	70.3	49.3	60.3	59.3	55.0
—	Lead and lead compounds	45.3	45.0	41.0	65.2	64.0	63.7
—	Mercury and mercury compounds	37.4	32.8	10.6	12.2	14.1	66.0
—	Nickel and nickel compounds	15.5	16.5	12.1	18.0	13.9	12.6
Total for 33/50 Chemicals		44.9	45.6	44.0	48.7	38.6	52.6
All Other TRI Chemicals		32.6	30.4	34.4	26.7	23.6	23.9
Total for All TRI Chemicals		36.3	34.8	37.3	33.0	28.0	32.2

Note: Data for 1991-1995 from Form R of that year, data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

Figure 19. Forms Reporting Source Reduction Activity: Percent of All Production-related Waste, 1991-1996



Note: Data for 1991-1995 from Form R of that year, data for 1996-1998 from 1996 Form R. Does not include delisted chemicals, chemicals added in 1994 and 1995, ammonia, hydrochloric acid, and sulfuric acid.

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